SMOLENSKIY, B.L.; ROKHLENKO, M.A.

Semiautomatic control of the dinking and cogging of self-centering nut slots. Kuz.-shtam.proizv. 5 no.7:40-41 Jl '63. (MIRA 16:9)

ROKHLENKO, M.I.; SMOLENSKIY, B.L.

New dynamometers. Mashinostroitel' no.7:24 Jl '63. (MIRA 16:9)
(Dynamometers)

SMOLENSKIY, B.L. [Smolens'kyi, B.L.], inzh.

Head of a cutter. Mekh. sil'. hosp. 14 no.9:13 S '63.
(MIRA 17:1)

SMOLENSKIY, B.L.; ROKHLENKO, M.A.

Power wrench with a pulse-percussion mechanism and pneumatic drive. Stan.i instr. 34 no.1:41-43 Ja '63. (MIRA 16:2)
(Wrenches)

ROKHLENKO, M.A.; SMOLENSKIY, B.L.

Hand vacuum suction devices. Stan.i instr. 34 no.7:37 Jl '63. (MIRA 16:9)
(Implements, tools, etc.)

SMOLENSKIY, B. L.; GOSPODARCHUK, I. L.; ROKHLENKO, M. A.

Automatic machine for countersinking chamfers. Mashinostroitel' no.12:7 D '62. (MIRA 16:1)

(Machine tools)

SMOLENSKIY, B.L.

Mechanized dividing head for milling slits. Mashinostroitel' no.3:29 Mr '63. (MIRA 16:4)
(Milling machines--Attachments)

KOKHLENKO, M.A.; SMOLENSKIY, B.L.

Manual pneumatic clamps for power riveting. Kuz.-shtam. proizv. 5 no.1: 42-43 Ja '63. (MIRA 16:2)

(Pneumatic tools) (Rivets and riveting)

ROKHLENKO, M.A., inzh.; SMOLENSKIY, B.L., inzh.

Checking the "optics" of sight glass. Stek. i ker. 20 no.4: 29-30 Ap '63. (MIRA 16:3)

(Glass--Testing)

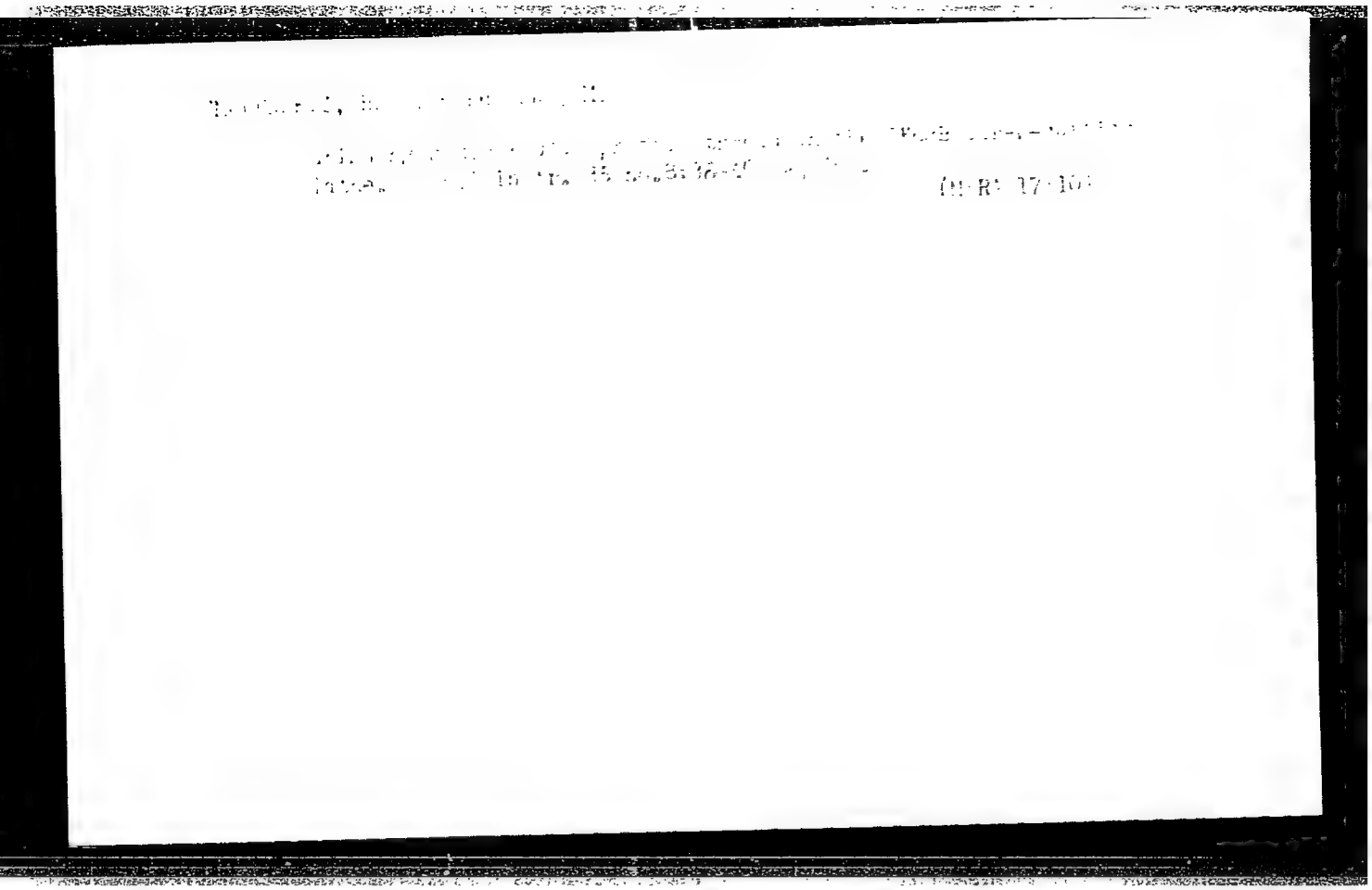
SMOLENSKIY, B.L.; ROKHLENKO, M.A.

Modernization of a laying-out milling machine. Stan.i instr. 34 no.2:39-40 F '63. (MIRA 16:5)
(Milling machines)

SMOLENSKIY, B.L.; ROKHLENKO, M.A.

Tool holder with quick-change holders. Stan.i instr. 34 no.5:39-40 My '63. (MIRA 16:5)

(Metal-cutting tools)



[redacted]

High-capacity pneumatic sweeper. Mashinostroitel' no.4:12 Ap '65.
(MIRA 18:5)

ROKHLENKO, M.A., SMOLENSKIY, B.L.

Control of pneumatic-tool noise. Mashinostroitel' no.5:40-41 My '65.
(MIRA 18:5)

[illegible] V. I.; [illegible]KHLENKO, M.A.

[illegible]s for testing screw threads with circulating balls. Izm.tekh. no.9:10-12 S '65. (MIRA 18:10)

AUTHORS: Klemeshov, G. A., Panasenko, F. L., Smolenskiy, F. A., Shvarts, S. M. 32-3-50/52

TITLE: Standard Laboratory for Radioactive Isotopes (Tipovaya laboratoriya radioaktivnykh izotopov)

PERIODICAL: Zavodskaya Laboratoriya, 1958, Vol. 24, Nr 3, pp. 376-379 (USSR)

ABSTRACT: This paper contains a short description of a laboratory project designed forea large metallurgical plant. In this laboratory it is intended to use isotopes of carbon, sulphur, phosphorus, silicon, manganese, calcium, iron, cobalt, iridium, etc. Particular attention was paid to special sanitary protective measures in the working, distribution, transport, etc. of isotopes. For this reason the laboratory project was worked out according to a three-zone system. This system includes hermetically closed rooms which are radiologically "contaminated". Isolated from these are the "half-clean" rooms, and, completely separated, the "clean" rooms. In the first-named rooms preparation-, purification-, and repair work etc. is carried out, for which purpose special clothing is worn, or, for aerosol work, hermetically closed

Card 1/2

chambers are used. A schematical drawing of a hermetically closed furnace, in which it is possible to melt radioactive isotopes in the vacuum, air, or inert gas atmosphere, is given. Conveying radioactive preparations from one chamber into another is brought about mechanically by means of a conveyer band, whilst a special air conditioning system is used for the purification of air. A ground section of the laboratory shows the arrangement of rooms as well as other details. Thus, the building also contains a room for gamma defectoscopy with an adjoining chamber with radioscopic devices of the type ГУП -Co-5-1, ГУП -Co-50-1 and KC-6; these devices are remote-controlled. There are 2 figures.

ASSOCIATION: State Institute for the Planning of Metallurgical Plants "Giprostal'" (Gosudarstvennyy institut po proyektirovaniyu metallurgicheskikh zavodov "Giprostal'")

AVAILABLE: Library of Congress

Card 2/2 1. Metallurgical laboratories-Characteristics

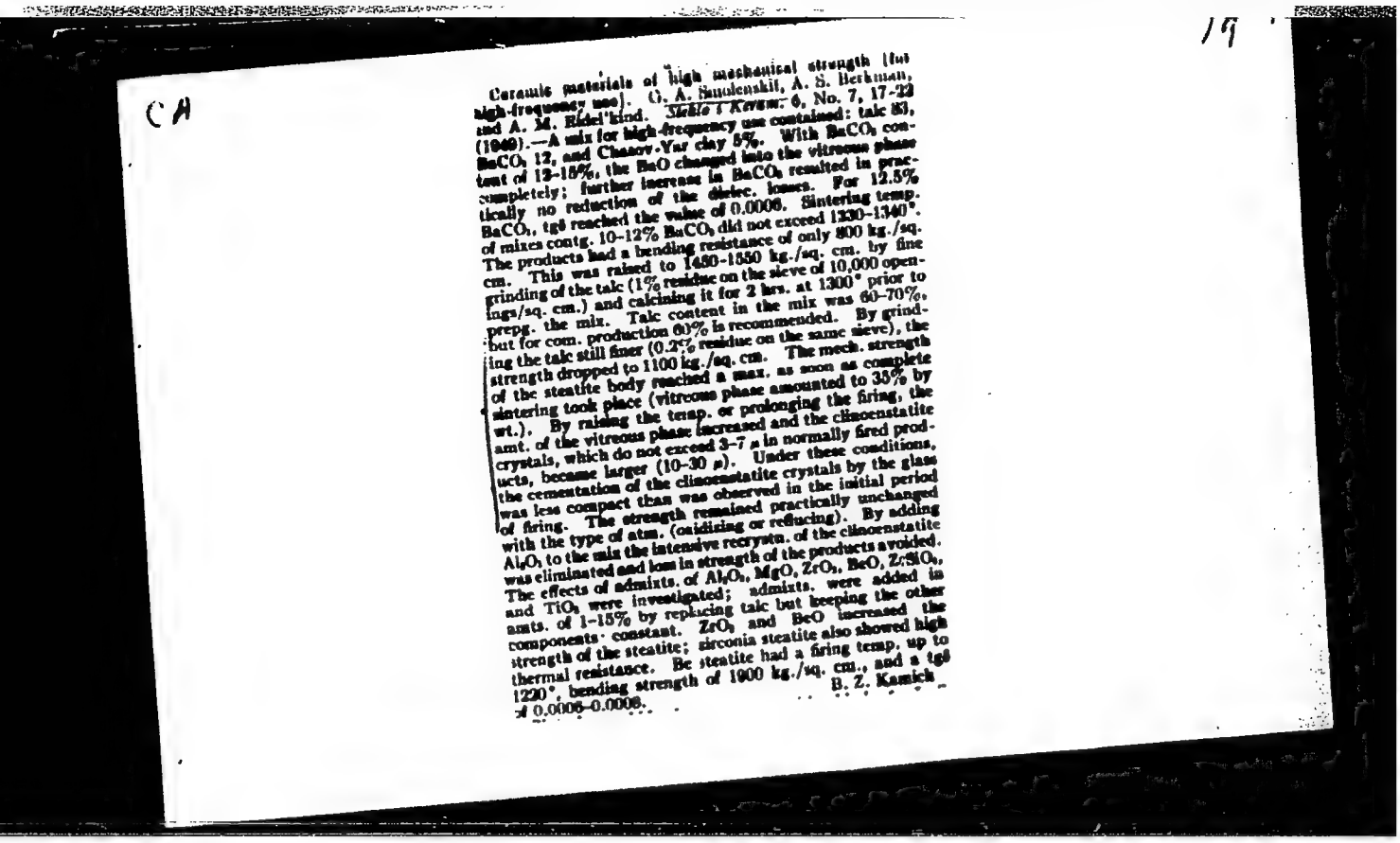
[redacted], I. I.

Opyt funktsional'nogo issledovaniya pecheni pri nedostatochnosti krovoobrashcheniya
Trudy Gos terapevt kliniki (Ivan. gos. med. IN-T) VYP. 3, 1 49, s. 54-59
II. Endokrinologiya

SO: LETOPIS' NO. 35, 1949

SMOLENSKIY, G. A.

"Ti in--Ceramic Mate ial with a Small Temperature Dependence of the Dielectric Susceptibility," Zhur. Tekh. iz., 15, No. 3, 1945; "New Piezoelectrics," Dok. AN, 70, No. 3, 1950; "Piezoelectrical roperties of Certain Titanates and Zirconates of Bivalent Metals Possessing a Structure of the Perovskite Type," Zhur. Tekh. Fiz., 20, No. 2, 1950; "On uestion of Origin of Piezoelectricity," Dok. AN, 76, No. 4, 1951.



CA

19

Ceramic materials of high mechanical strength [for high-frequency use]. G. A. Smolenskii, A. S. Berkman, and A. M. Rabel'kind. *Steklo i Keram.* 6, No. 7, 17-22 (1949).—A mix for high-frequency use contained: talc 83, $BaCO_3$ 12, and Chasov-Yar clay 5%. With $BaCO_3$ content of 12-18%, the BaO changed into the vitreous phase completely; further increase in $BaCO_3$ resulted in practically no reduction of the dielec. losses. For 12.5% $BaCO_3$, tgδ reached the value of 0.0006. Sintering temp. of mixes contg. 10-12% $BaCO_3$ did not exceed 1330-1340°. The products had a bending resistance of only 800 kg./sq. cm. This was raised to 1450-1550 kg./sq. cm. by fine grinding of the talc (1% residue on the sieve of 10,000 openings/sq. cm.) and calcining it for 2 hrs. at 1300° prior to prepg. the mix. Talc content in the mix was 60-70%, but for com. production 60% is recommended. By grinding the talc still finer (0.2% residue on the same sieve), the strength dropped to 1100 kg./sq. cm. The mech. strength of the steatite body reached a max. as soon as complete sintering took place (vitreous phase amounted to 35% by wt.). By raising the temp. or prolonging the firing, the amt. of the vitreous phase increased and the clinoenstatite crystals, which do not exceed 3-7 μ in normally fired products, became larger (10-30 μ). Under these conditions, the cementation of the clinoenstatite crystals by the glass was less compact than was observed in the initial period of firing. The strength remained practically unchanged with the type of atm. (oxidizing or reducing). By adding Al_2O_3 to the mix the intensive recrystn. of the clinoenstatite was eliminated and loss in strength of the products avoided. The effects of admixts. of Al_2O_3, MgO, ZrO_2, BeO, $ZrSiO_4$, and TiO_2 were investigated; admixts. were added in amts. of 1-15% by replacing talc but keeping the other components constant. ZrO_2 and BeO increased the strength of the steatite; zirconia steatite also showed high thermal resistance. Be steatite had a firing temp. up to 1220°, bending strength of 1900 kg./sq. cm., and a tgδ of 0.0005-0.0008.

B. Z. Kamich

PA 156T107

USSR/Physics - Crystals, Piezoelectric Titanium Compounds — Feb 50

"Piezoelectrical Properties of Certain Titanates and Zirconates of Bivalent Metals Possessing a Structure of the Perovskite Type," G. A. Smolenskiy, 11 pp

"Zhur Tekh Fiz" Vol XX, No 2

Studies dielectric permeability of subject titanates and zirconates. Establishes $CdTiO_3$, $PbTiO_3$, $PbZrO_3$, and also solid solutions of $(Ca, Pb)TiO_3$ and $(Sr, Pb)TiO_3$ are "seignette-electrical" (piezoelectric), like Rochelle salt crystals. Curie temperature of these

[redacted] 156T107

USSR/Physics - Crystals, Piezoelectric (Contd) — Feb 50

piezoelectrics is determined considerably by degree of covalent character of bond in lattice and by dimensions of octahedron in which titanium ion is located. Establishes piezoelectrics of this type possess below the Curie point a tetragonal lattice. Submitted 9 Mar 49.

[redacted] 156T107

SMOLENSKIY, G. A.

SMOLENSKIY, G. A.

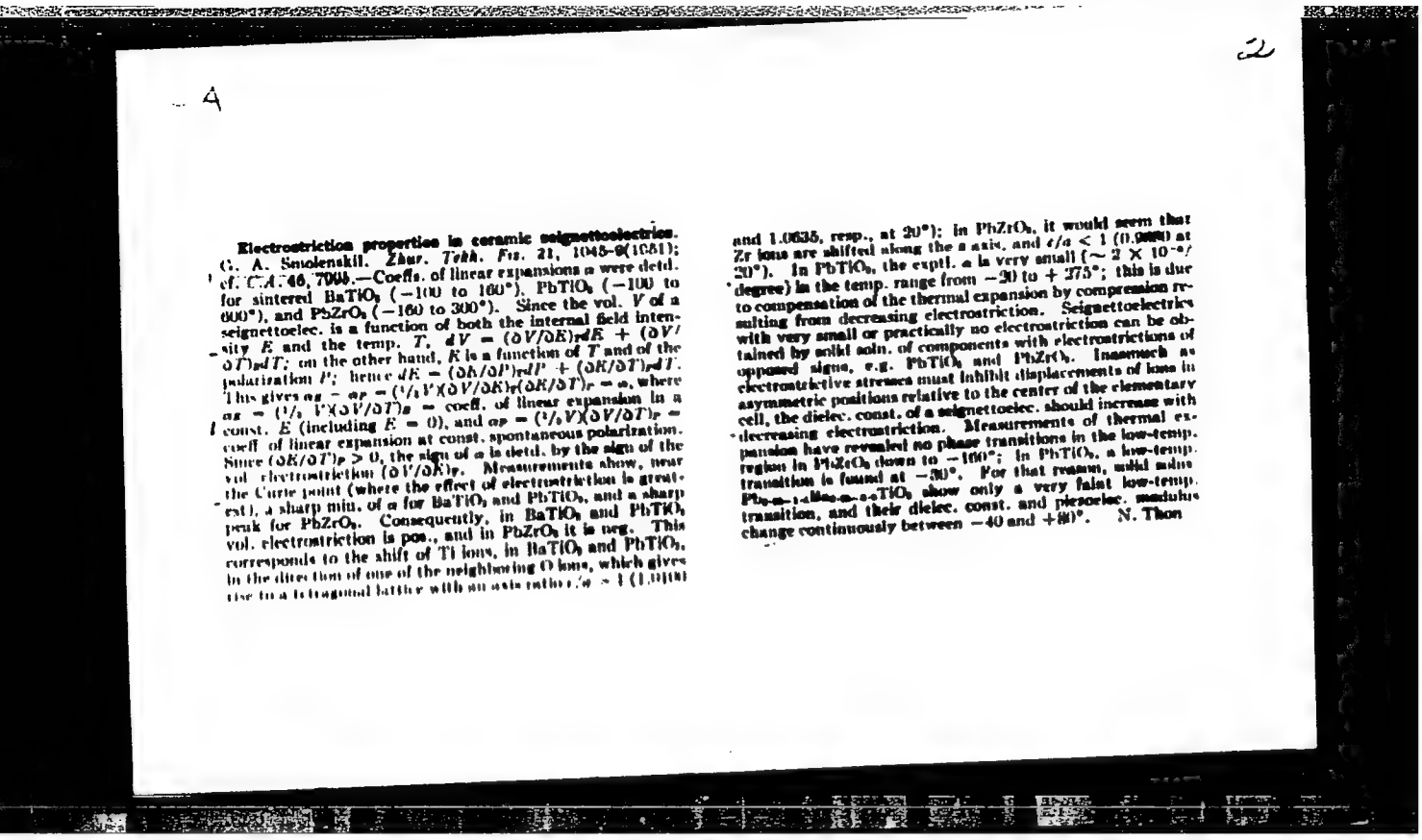
USSR/Physics - Piezoelectric Titanates — Jan 50

"New Piezoelectrics," G. A. Smolenskiy, 3 pp

"Dok Ak Nauk SSSR" Vol LXX, No 3

Considerations on ionic lattice structure of ABO_3 (where A can be Sr, Ba, Cd, Pb, etc., and B is Ti, Zr, Sn, Hf, Th, Ce, etc.) indicated that titanates other than barium titanate should be piezoelectric. Experimentally shows titanates of calcium, strontium, cadmium, lead and lead zinconate are piezoelectric. Submitted 22 Nov 49 by Acad S. I. Vavilov.

[redacted] 158T89



4

2

Electrostriction properties in ceramic seignettoelectrics. G. A. Smolenskii. *Zhur. Tekh. Fiz.* 21, 1043-9(1951); cf. *C.A.* 46, 7004.—Coeffs. of linear expansions α were detd. for sintered $BaTiO_3$ (−100 to 160°), $PbTiO_3$ (−100 to 600°), and $PbZrO_3$ (−160 to 300°). Since the vol. V of a seignettoelec. is a function of both the internal field intensity E and the temp. T, $dV = (\partial V/\partial E)_T dE + (\partial V/\partial T)_E dT$; on the other hand, E is a function of T and of the polarization P; hence $dE = (\partial h/\partial P)_T dP + (\partial K/\partial T)_P dT$. This gives $\alpha_E - \alpha_P = (1/V)(\partial V/\partial K)_T(\partial K/\partial T)_P = \omega$, where $\alpha_E = (1/V)(\partial V/\partial T)_E$ = coeff. of linear expansion in a const. E (including $E = 0$), and $\alpha_P = (1/V)(\partial V/\partial T)_P$ = coeff. of linear expansion at const. spontaneous polarization. Since $(\partial K/\partial T)_P > 0$, the sign of ω is detd. by the sign of the vol. electrostriction $(\partial V/\partial K)_T$. Measurements show, near the Curie point (where the effect of electrostriction is greatest), a sharp min. of α for $BaTiO_3$ and $PbTiO_3$, and a sharp peak for $PbZrO_3$. Consequently, in $BaTiO_3$ and $PbTiO_3$ vol. electrostriction is pos., and in $PbZrO_3$ it is neg. This corresponds to the shift of Ti ions, in $BaTiO_3$ and $PbTiO_3$, in the direction of one of the neighboring O ions, which gives rise to a tetragonal lattice with an axis ratio $c/a > 1$ (1.0101 and 1.0635, resp., at 20°); in $PbZrO_3$, it would seem that Zr ions are shifted along the a axis, and $c/a < 1$ (0.9[illegible] at 20°). In $PbTiO_3$, the expti. α is very small ($\sim 2 \times 10^{-6}$/degree) in the temp. range from −20 to + 275°; this is due to compensation of the thermal expansion by compression resulting from decreasing electrostriction. Seignettoelectrics with very small or practically no electrostriction can be obtained by solid soln. of components with electrostrictions of opposed signs, e.g. $PbTiO_3$ and $PbZrO_3$. Inasmuch as electrostrictive stresses must inhibit displacements of ions in asymmetric positions relative to the center of the elementary cell, the dielec. const. of a seignettoelec. should increase with decreasing electrostriction. Measurements of thermal expansion have revealed no phase transitions in the low-temp. region in $PbZrO_3$ down to −160°; in $PbTiO_3$, a low-temp. transition is found at −20°. For that reason, solid solns [illegible] show only a very faint low-temp. transition, and their dielec. const. and piezoelec. modulus change continuously between −40 and +80°. N. Thon

CA

The problem of the origin of seignettoelectricity. G. A. Smolenskiĭ and N. V. Kozhevnikova. *Doklady Akad. Nauk S.S.S.R.* 76, 519–22(1951); cf. *C.A.* 44, 3781a.—Survey of the crystals showing seignettoelec properties (I) ($BaTiO_3$, $PbTiO_3$, $CdTiO_3$, $SrTiO_3$, $PbZrO_3$, and, more recently $NaTaO_3$, $KTaO_3$, $NaNbO_3$, $KNbO_3$, WO_3, $LiTaO_3$, $LiNbO_3$) leads to the conclusion that I is linked with crystals in which the O octahedrons are partly or wholly populated by cations formed from atoms with an incomplete next-to-outermost shell, having an inert-gas electronic structure, a large charge, and a small radius. Spontaneous polarization arises owing to the dipole moments due to displacement of these cations relative to the centers of the octahedrons. In Seignette salt, in KH_2PO_4, and in KH_2AsO_4, this spontaneous polarization is due to rich displacement of H^+ ions. The most favorable structure for appearance of I is that wherein the octahedrons meet in corners, as in perovskite; structures with common edges are less favorable, and still less, structures with common faces. The coördination no. is important from the point of view of the dimensions of the octahedron; in perovskite, ions with the coördination no. 12 can expand the octahedron considerably. From the point of view of favorable charge and radius, the ions V^{++}, Cr^{++}, Mo^{++}, Mn^{++}, Tc^{++}, and Re^{++}, if they are built into O octahedrons, should constitute suitable central atoms for I of the crystal. In addn. to the known seignettoelectrics, $CuTaO_3$, $AgTaO_3$, $AuTaO_3$, and $RbNbO_3$, $CuNbO_3$, $AgNbO_3$, $AuNbO_3$ (if of perovskite structure) can be expected to exhibit I character at certain temps. By exptl. detns. of the thermal expansion coeff., the structure, and the lattice parameters, $RbTaO_3$ (perovskite-type, tetragonal, $a = 3.92$, $c = 4.51$ A.) is a seignettoelectric, with a Curie point of ~820°K., and possibly also MoO_3 (anatase structure, in which every 3rd octahedron layer, along the quaternary axis of cubic close packing, is unoccupied; $a = 3.90$, $b = 13.94$, $c = 3.66$ A.) with a Curie point ~880°K. The Curie point of $KTiO_3$ should lie below that of $RbTiO_3$, contrary to Matthias and Remeika (*Phys. Rev.* 76, 1886 (1949)); $NaTiO_3$ most probably is not a seignettoelectric. In the rutile-type tetragonal forms of $Fe(NbO_3)_3$ and $Fe(TaO_3)_3$, spontaneous polarization may be counteracted by Fe^{++} ions in the octahedrons, and the same applies in an even greater degree to $LiTiO_3$. N. Thon

1951

SMOLENSKIY, G. A.

USSR/Metals - Structure 11 Jun 51

"Ferrites of Divalent Metals," G. A. Smolenskiy

"Dok Ak Nauk SSSR" Vol LXXVIII, No 5, pp 921-924

Studied solid solns of ferromagnetic ($NiFe_2O_4$, $CuFe_2O_4$, $MnFe_2O_4$, $MgFe_2O_4$) and nonferromagnetic ($ZnFe_2O_4$, $CdFe_2O_4$) ferrites. Graphs relations between concn of nonferromagnetic ferrite in some solid solns and certain properties of these solns, such as Curie point, magnetostriction on saturation, magnetic permeabilities, coercive forces and hysteresis losses. Submitted by Acad I. V. Grebenshchikov 16 Apr 51.

184T92

SMOLENSKIY, G. A.

USSR/Physics - Piezoelectricity 1 Jul 51

"Piezoelectric Properties of Some Solid Solutions," G. A. Smolenskiy, M. A. Karamyshev, K. I. Rozgachev

"Dok Ak Nauk SSSR" Vol LXXIX, No 1, pp 53-56

Authors investigate temp dependence of coeff of linear widening of solid solns. At low temps, points of phase transitions of solid solns are shifted lower, with increased $SrTiO_3$ content, than the Curie point. Authors are indebted to Prof P.P. Kobeko. Presented by Acad A. F. Ioffe 7 May 51.

210T81

CA

2

The theory of seignettoelectricity. G. A. Smolenskii and R. E. Pasynkov (Silicate Chem. Inst., Acad. Sci. U.S.S.R., Moscow). *Doklady Akad. Nauk S.S.S.R.* 79, 431–4 (1951); cf. *C.A.* 45, 3675g.—The thermodynamic potential of a perovskite-type seignettoelec. substance near its Curie point is written down as a function of the components of the polarization vector, the elec. field strength vector, the deformation tensor, the elastic consts., and consts. depending on the temp. and pressure. Partial differentiation with respect to the polarization and the deformation components yields a system of equations permitting investigation of the different states of a one-domain single crystal. As a result of deformation of the crystal in the absence of an elec. field, below the Curie point, the discontinuity of the heat capacity and the rate of growth of the spontaneous polarization increase with decreasing temp. In an elec. field, deformation and piezoelec. moduli have opposite signs in $BaTiO_3$ and in $PbZrO_3$. The shift of the Curie point of a seignettoelec. substance under static pressure depends on the sign of the vol. electrostriction λ_v: in the case $\lambda_v > 0$ ($BaTiO_3$, $PbTiO_3$), the Curie point moves to lower, and in the case of $\lambda_v < 0$ ($PbZrO_3$) to higher, temps.; with zero electrostriction, the Curie point is independent of the pressure. The polarization, at a given temp., decreases with increasing pressure in the case $\lambda_v > 0$, increases with $\lambda_v < 0$, and remains unchanged with $\lambda_v = 0$. Of the existing theories of seignettoelectricity, that of Mason and Matthias (*C.A.* 43, 2055d) leads to the conclusion that in $BaTiO_3$ the transition point is close to the Curie point, which is in conflict with exptl. data; the treatment by M. and M. of the model in which the Ti^{++} ion forms covalent bonds with the O^{--} ions and the elementary cell contains 6 minima of potential energy, is legitimate only in the case of the potential barrier, u_0, between the minima, fulfilling the inequality $u_0 \gg F\mu$ (where F = internal field, μ = elec. moment of the elementary cell), whereas actually $u_0 = F\mu$. The theories of Devonshire (*C.A.* 44, 1775a) and Slater (*C.A.* 44, 8180d), under which the Curie point is detd. by the dimensions of the central ion and the octahedron, are unable to account for the decrease of the Curie point from $PbTiO_3$ to $BaTiO_3$ and from $PbZrO_3$ to $BaTiO_3$.

N. Thon

SMOLENSKIY, G. A.

The Nonmetallic Ferromagnetics - Ferrites, G.A.Smolenskiy, Inst of Chem of Silicates, Acad Sci USSR, Iz Ak Nauk SSSR, Ser Fiz, Vol 16, No 6, pp 728-738, Nov/Dec 52.

Analysis of ferrites of the type MFe_2O_4 (where M is a divalent metal), which were obtained by reaction method in solid-phase state. The properties of the ferrites were studied and plotted on graphs and tables. Indebted to Ya. G. Dorfman.

251T24

USSR/Physics - Dielectric Loss — Jan 52

"Polarization and Dielectric Losses in Zirconates, Stannates and Certain Titanates of Bivalent Metals," G. A. Smolenskiy

"Zhur Tekh Fiz" Vol XXII, No 1, pp 3-11

Investigates dielec permeability, its temp dependence and tangent of the angle of dielec loss of zirconates, stannates and certain titanates of bivalent metals. Establishes that in zirconates and stannates with structure of the perovskite type the dielec permeability increases with increase in the radius of the bivalent cation and its temp coeff's sign changes. Shows that it is

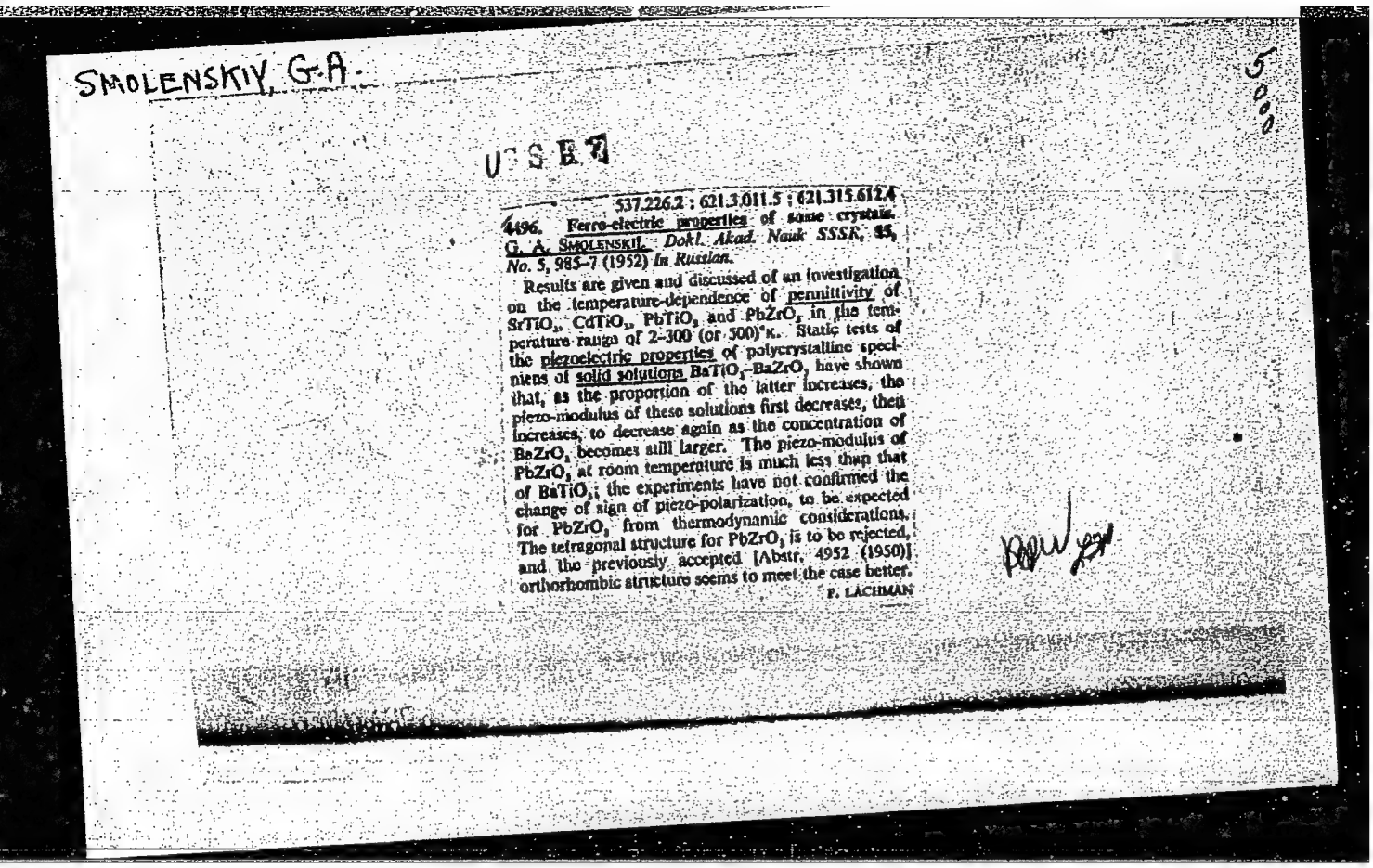
206T97

USSR/Physics - Dielectric Loss (Contd) — Jan 52

necessary to consider also anharmonics in order to explain the decrease in dielec permeability of $BaZnO_3$ and $BaSnO_3$ with increase in temp of oscillation of the central ions in these crystals. Submitted 1 Jul 51.

206T97

SMOLENSKIY, G. A.



SMOLENSKIY, G.A.

USSR

5000

537.226.2 : 621.3.011.5 : 621.315.612.4

4496. Ferro-electric properties of some crystals. G. A. SMOLENSKII. *Dokl. Akad. Nauk SSSR*, 85, No. 5, 985–7 (1952) *In Russian.*

Results are given and discussed of an investigation on the temperature-dependence of permittivity of $SrTiO_3$, $CdTiO_3$, $PbTiO_3$ and $PbZrO_3$ in the temperature range of 2–300 (or 500)°K. Static tests of the piezoelectric properties of polycrystalline specimens of solid solutions $BaTiO_3$–$BaZrO_3$ have shown that, as the proportion of the latter increases, the piezo-modulus of these solutions first decreases, then increases, to decrease again as the concentration of $BaZrO_3$ becomes still larger. The piezo-modulus of $PbZrO_3$ at room temperature is much less than that of $BaTiO_3$; the experiments have not confirmed the change of sign of piezo-polarization, to be expected for $PbZrO_3$ from thermodynamic considerations. The tetragonal structure for $PbZrO_3$ is to be rejected, and the previously accepted [Abstr. 4952 (1950)] orthorhombic structure seems to meet the case better.

F. LACIMAN

SMOLENSKIY, G.A.

USSR

Thermodynamic theory of seignettoelectric substances having perovskite-type structure. G. A. Smolenskii and R. E. Pasynkov. *Zhur. Eksptl. i Teoret. Fiz.* 24, 69–77 (1953).—The phase transition from cubic (nonseignettoelec.) to tetragonal (seignettoelec.) is calcd. A system of equations is obtained relating the components of the elec. field and the changes of thermodynamic potential with deformation to the polarization vector, the elastic and electrostriction consts., and to coeffs. of temp. and pressure. A discussion of these equations shows that an increase in spontaneous deformation of the crystal below the Curie point increases the rise in heat capacity and the speed of growth of polarization with falling temp. A solution of the equations for weak elec. fields gives a correct matrix of coeff. of electrostriction and piezoelec. moduli. The Curie point is linearly dependent on pressure, as experimentally found for $BaTiO_3$. The Curie point is displaced in the opposite direction if the compression is not isotropic but directed along the x axis only. The dielec. permeability of a "fixed" crystal (all piezoelec. deformations = 0) is smaller than in a "free" crystal.

S. Paksver

SMOLENSKIY, G.A.

8731. About the problem of the molecular theory of ferroelectrics. G. A. SMOLENSKII AND R. E. PASYNKOV. *Zh. eksper. teor. Fiz.*, 25, *No.* 1(7), 57–73 (1953) In Russian. 537.226.2

Contemporary molecular theories of ferroelectricity are reviewed. A general form of the local minima model is discussed. There phase transitions correspond to the critical Curie point. Low-temperature phase transitions are investigated. Properties of barium titanate are not explained satisfactorily by the model with a constant number of local minima for all temperature ranges. The existing method of calculation, based on the application of the anharmonic oscillator model, is shown to be identical with the application of the thermodynamic displacement theory for calculation of free energy of association of anharmonically oscillating ions. Several properties of ferroelectrics depend on fluctuations of displacements of these ions. The possibility of application of the anharmonic oscillator model to other crystals with perovskite type structure is considered.

J. LUKASZEWICZ

SMOLENSKIY, G.A.

3

USSR

537.226.2

4500. Ferroelectric properties of $BaTiO_3$-$PbZrO_3$ solid solutions. G. A. SMOLENSKII, A. I. AGRANOVSKAYA AND N. N. KRAINIK. *Dokl. Akad. Nauk SSSR*, 91, *No.* 1, 55-8 (1953) *In Russian.* English translation, *U.S. National Sci. Found. NSF-tr-81.*

In the solid solutions studied both the divalent and tetravalent cations are replaced simultaneously. The temperature dependence of the dielectric constant in weak fields and the thermal linear expansion were determined. The results are discussed in terms of the statistical distribution of the four components $BaTiO_3$, $BaZrO_3$, $PbTiO_3$, $PbZrO_3$ in the lattice.

C. A. HOGARTH

RDW
LSW

SMOLENSKIY, Georgiy Anatol'yevich.

Inst of Chemistry of Silicates Acad Sci USSR. Academic degree of Doctor of Physical and Mathematical Sciences, based on his defense, 22 November 1954, in the Council of Physics Inst imeni Lebedev, Acad Sci USSR, of his dissertation entitled: "Segnete-electrics with a Structure of the 'Perovekit' (?) Type."

Academic degree and/or title: Doctor of Sciences

SO: Decisions of VAK, List no. 14, 11 June 55, Byulleten' MVO SSSR, No, 15, Aug 56, Moscow, pp. 5-24, Uncl. JPRS/NY-537

SMOLENSKIY G.A.

USSR

537.226.2 : 621.315.612.4

2707. **Ferroelectric properties of solid solutions of barium stannate in barium titanate.** G. A. SMOLENSKII AND V. A. ISUPOV. *Zh. tekh. Fiz.*, 24, *No.* 8, 1375–86 (1954) In Russian.

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①

The volumetric electrostriction of solid solutions with small barium stannate content is greater than 1 in the Curie range. Solid solutions with small electrostriction (10–12% $BaSnO_3$) have high maximum permittivity in weak fields, their relationship between permittivity and field strength is sharply defined. The permittivity of solid solutions with high barium stannate content changes considerably with small temperature changes. The Curie temperature of solid solutions decreases when barium stannate content increases. At the same time low-temperature phase transformations move towards higher temperatures. A change of structure from cubic to rhombohedral occurs on cooling solid solutions containing > 12% of barium stannate. Piezo-oscillations occur in solid solutions with sufficiently high barium stannate content at temperatures higher by 20–30°c than corresponding values for maximum dielectric permittivity. Solid solutions have no single Curie temperature but a range of Curie temperatures, which can be explained by considerable internal stresses. The resonance frequencies and consequently the modulus of rigidity of the solid solutions investigated increase with barium stannate content.

J. LUKASZEWICZ

SMOLENSKI, [redacted] G.A.

Ferroelectric Properties of Solid Solutions of Barium Zirconate in Barium Titanate. G. A. Smolenskii, N. P. Tarutin & N. P. Gruditsin. (Zh. tekh. Fiz., Sept. 1954, Vol. 24, No. 9, pp. 1584–1593.) An experimental investigation of solutions containing up to 40% (molar) of $BaZrO_3$. Results, which are presented graphically, show that (*a*) the highest value of dielectric constant (> 12 000) at a frequency of 1 kc/s occurs for 18–20% $BaZrO_3$ content, (*b*) the Curie temperature is displaced downwards more slowly than in the $BaSnO_3$-in-$BaTiO_3$ solutions due to the different character of the bonds of Zr and Sn ions with oxygen ions, (*c*) the dielectric constant of solutions with low electrostriction falls considerably following polarization at high field strengths, (*d*) the dependence of resonance frequencies on field strength decreases with increase of the zirconate content, and (*e*) the piezoelectric-modulus maximum occurs at a temperature slightly lower than that corresponding to the dielectric-constant maximum. Some properties of pure $BaTiO_3$ were also investigated.

SMOLENSKIY, G.A.

GERM

Ferroelectric Properties of Solid Solutions in the System Barium-Titanate/Strontium-Titanate. —G. A. Smolenski & K. I. Rozgachev. (*Zh. tekh. Fiz.*, Oct. 1954, Vol. 24, No. 10, pp. 1751–1760.) Results are reported of an experimental investigation on specimens containing up to 95% molar of $SrTiO_3$. The dielectric-constant/temperature characteristics of the specimens, determined at 1 kc/s and at 740 kc/s, exhibit a maximum whose value increases from about 7 500 for pure $BaTiO_3$ up to about 15 000 for a 60% $SrTiO_3$ solution, decreasing again at higher concentrations of $SrTiO_3$. The temperatures at which these maxima occur decrease from about 120°C for pure $BaTiO_3$ to about — 200°C for 90% $SrTiO_3$. Spontaneous polarization is a minimum in 30–40% $SrTiO_3$ solutions. Phase transitions, the effect of applying a constant electric field, and spontaneous electrostriction were also investigated. Results are presented graphically.

SMOLENSKIY, G.A.

USSR/Physics - Piezoelectrics FD-716

Card 1/1 : Pub 146-4/18

Author : Smolenskiy, G. A., and Kozlovskiy, V. Kh.

Title : Thermodynamic theory of antipiezoelectrics

Periodical : Zhur. eksp. i teor. fiz., 26, 684-695, Jun 1954

Abstract : Discusses phase transitions from an antipiezoelectric state into a paraelectric one or a piezoelectric one. 7 references, including 3 foreign.

Institution : Institute of Silicate Chemistry, Acad. Sci. USSR

Submitted : October 12, 1954

SMOLENSKIY, G.A.

Phase changes of certain solid solutions having electrical properties of Rochelle salt. G. A. Smolenskiĭ and V. A. Isupov. *Doklady Akad. Nauk S.S.S.R.* 96, 53–4(1954).—The constitutional diagram for $BaTiO_3$-$BaSnO_3$ shows that up to 12% $BaSnO_3$ the solid-soln. field is divided into areas of cubic, tetragonal, orthorhombic, and rhombohedric crystals, and only one transformation can be observed on passing the Curie point in the presence of 12% or more of $BaSnO_3$, namely from cubic to rhombohedral. An increased $BaSnO_3$ content reduces elec. moment, destroys spontaneous polarization defined by the dipolar interaction, and lowers the Curie point. Shifting of low-temp. phase changes is caused by simultaneous unidirectional movements of Sn and Ti ions within individual domains occurring at definite $BaTiO_3$ concns. at temps. under the Curie point. Ions move with the greatest freedom along the [111] and with most difficulty along [001]. Higher $BaSnO_3$ concn. moves the transformation temp. upward. The Curie point of $BaTiO_3$-$BaZrO_3$ system shifts at low temps. more slowly than in the $BaSnO_3$-$BaTiO_3$ system. This is caused by different characteristics of bonds of the Zr and Sn ions with those of O. Tin ions move to a lesser extent in respect to the center of the lattice than do Zr ions. A higher $BaZrO_3$ concn. also moves the transformation point higher, and at 18% or more only the rhombohedral phase is present. In the $BaTiO_3$-$SrTiO_3$ system, the transformation point shifts towards lower temps. with higher $SrTiO_3$ content more slowly than does the Curie point. J. D. Gat

(1)

SMOLENSKIY, G. A.

USSR/Physics

Card 1/1

Authors : Smolenskiy, G. A., and Arganovskaya, A. I.

Title : Orgination of spontaneous polarization in lead-stannate and lead tantalate.

Periodical : Dokl. AN SSSR, 97, Ed. 2, 237 - 238, July 1954

Abstract : Experiments were conducted on lead-stannate to determine the conditions under which it would have, if any, segneto-electric properties. The atomic structure of lead containing crystals is analyzed. The possibilities of obtaining spontaneous polarization of every crystal, which may contain lead (Sn), was anticipated because of the atomic structure. Two graphs are given showing temperature-dependance of dielectric constants on lead-stannate and tantalate. Four references. Graphs

Institution : Acad. of Sc. USSR, Chemical Institute of Silicates

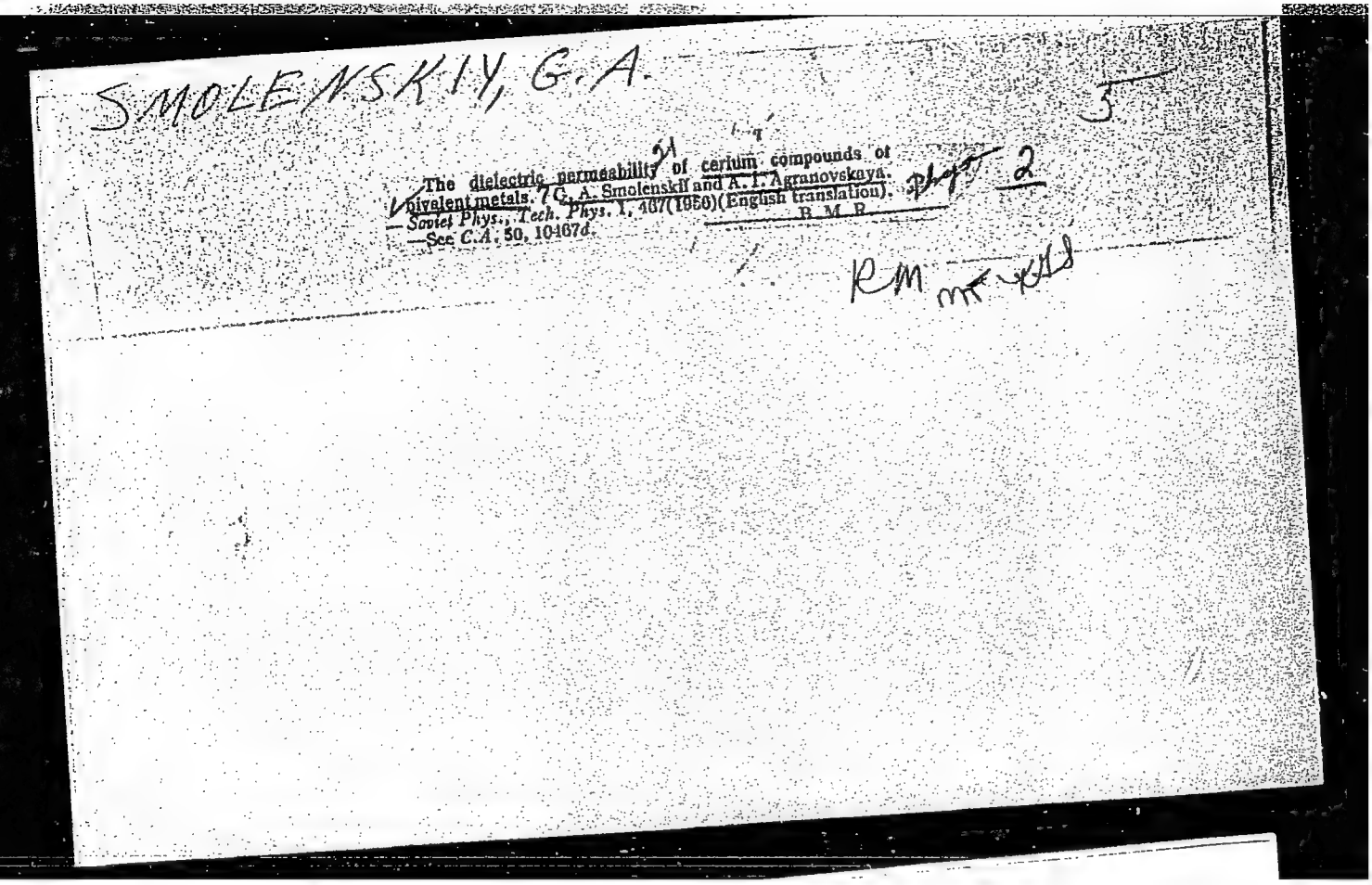
Presented by : Academician A. F. Ioffe, March 22, 1954

SMOLENSKIY, G.A.

Seignettoelectric properties of solid solutions: (Pb, Ba)-SnO_3, Pb(Ti, Sn)O_3, and Pb(Zr, Sn)O_3. G. A. Smolenskii, A. I. Agranovskaya, A. M. Kalinina, and T. N. Fedotova. *Zhur. Tekh. Fiz.* 25, 2211-12(1956).—The dielec. permeability and the dissipation factor were measured from 0 to 300°. In addn. the temps. of phase transitions for the various compds. as a function of compn. were detd. The results show that the solid soln. (Ba, Pb)SnO_3 (I) crystallizes with a perovskite structure and possesses seignettoelec. properties. These solns. differ from other seignettoelec. compds. in that the central atom does not have the at. structure of a noble gas. The transition temp. of I decreases as the $BaSnO_3$ content increases. The solid solns. Pb(Ti, Sn)O_3 and Pb(Zr, Sn)O_3 (II) shows high transition temps. if the percentage of $PbSnO_3$ is high. In II two phase transitions were discovered. Werner Jacobson

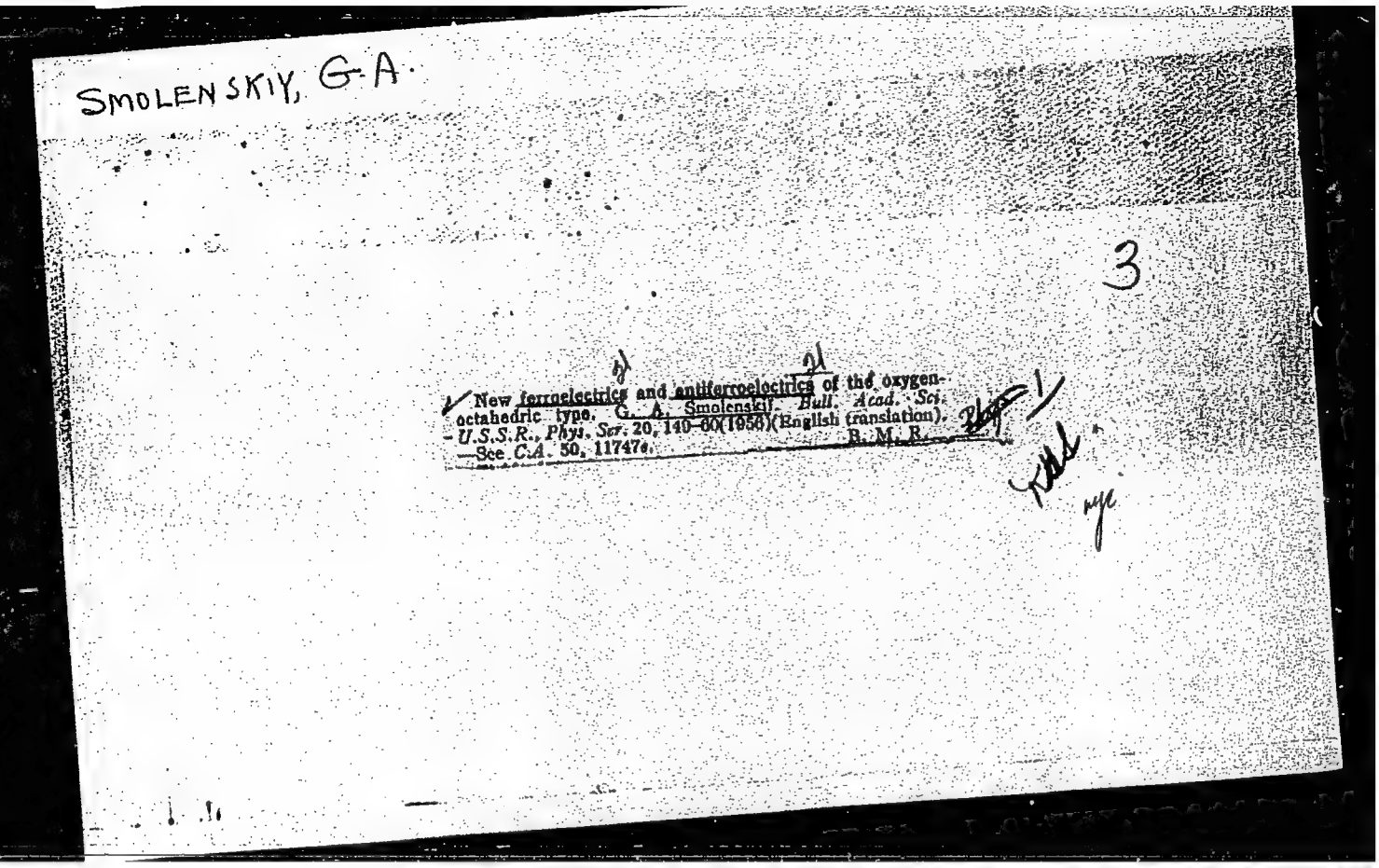
SMOLENSKIY, G. A.

The high dielectric permeability of the niobates and tantalates of the bivalent metals. G. A. Smolenskii, V. A. Isupov, and A. I. Agranovskaya. *Soviet Phys. "Doklady"* 1, 300–2(1950)(English translation).—See *C.A.* 51, 6251a. B. M. B.



SMOLENSKIY, G.A.

The dielectric permeability of cerium compounds of bivalent metals. / G. A. Smolenskii and A. I. Agranovskaya. Soviet Phys., Tech. Phys. 1, 487(1956)(English translation). B M B
See C.A. 50, 10467d.



SMOLENSKIY, G.A.

3

New ferroelectrics and antiferroelectrics of the oxygen-octahedric type. G. A. Smolenskii. *Bull. Acad. Sci. U.S.S.R., Phys. Ser.* 20, 140-60(1956)(English translation). B. M. R.
See *C.A.* 50, 11747e.

G-2

Category : USSR/Electricity - Dielectrics

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4143

Author : Smolenskiy, G.A.
Inst : Institute of Chemistry of Silicates, Academy of Sciences USSR
Title : New Ferroelectrics and Anti-Ferroelectrics of the Oxy-Octahedral Type

Orig Pub : Izv. AN SSSR, ser. fiz., 1956, 20, No 2, 163-177

Abstract : Survey of the properties of new ferroelectrics and anti-ferroelectrics with a structure of the perovskite, ilmenite, pyrochlorine, and rhenium-trioxide type. Generalization of the experimental data make it possible to establish that spontaneous polarization can occur in crystals, the oxygen octahedra of which are fully or partly populated with cations, having the electron structure of a noble gas atom after the emission of s-and d-electrons, a high charge, and a small ionic radius. Exceptions are crystals that bind lead ions Pb^{2+}, owing apparently to the influence of the strongly polarizable lead ions on the character of the bonds in these crystals. Bibliography, 38 titles.

Card : 1/1

OSTROUMOV, Andrey Georgiyevich, inzh.; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand.fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Piezoelectric substances] P'ezoelektriki. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 30 p. (Poluprovodniki, no.16) (MIRA 10:12)

(Piezoelectric substances)

PASYNKOV, Vladimir Vasil'yevich, doktor tekhn.nauk; IOFFE, A.F., akademik, glavnyy red.; SOMINSKIY, kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat.nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand. fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D., inzh.; FREGER, D.P., tekhn.red.

[Nonlinear semiconductor resistors; varistors] Nelineinye poluprovodnikovye soprotivleniia; varistory. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 35 p. (Poluprovodniki, no.5) (Electric resistors) (MIRA 11:1)

SMOLENSKIY, G.A.

MIRLIN, David Naumovich; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat. nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat.nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL, A.R., kand.fiz.-mat. nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh., red.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Semiconductor bolometers] Poluprovodnikovye bolometry. Leningrad, Leningr.dom nauchno-tekhn.propagandy. 1957. 36 p. (Poluprovodniki, no.4) (MIRA 10:12)

(Bolometer)

676

PHASE I BOOK EXPLOITATION

Smolenskiy, Georgiy Anatol'yevich, Doctor of Physical and Technical Sciences, Isupov, Vladislav Aleksandrovich, Engineer

Segnetoelektriki (Seignetoelectric Substances) [2d. ed., rev. and enl.] Leningrad, Leningradskiy Dom nauchno-tekhnicheskoy propagandy, 1957, 43 p. (Obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy. Poluprovodniki, vyp. 15) 15,000 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR. Institut poluprovodnikov, and Leningradskiy Dom nauchno-tekhnicheskoy propagandy.

Tech. Ed.: Freger, D. P.; Editorial Board: Ioffe, A. F., Academician (Ed. in Chief), Sominskiy, M. S., Candidate of Physical and Mathematical Sciences (Asst. Ed. in Chief), Maslakovets, Yu. P., Doctor of Physical and Mathematical Sciences, Smolenskiy, G. A., Doctor of Physical and Mathematical Sciences, Shalyt, S. S., Doctor of Physical and Mathematical Sciences, Regel', A. R., Candidate of Physical and Mathematical Sciences, Subashiyev, V. K., Candidate of Physical and Mathematical Sciences, Shagurin, K. A., Engineer, Achkinadze, Sh. D., Engineer.

Card 1/4

SUBASHIYEV, Vagan Kasparovich, kand. fiz.-mat. nauk,; IOFFE, A.F., glavnyy red.; SOMINSKIY, M.S., kand. fiz.-mat. nauk, red.; MASLAKOVETS, Yu. P., doktor fiz.-mat. nauk, red.; SMOLENSKIY, G.A.,doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat. nauk, red.; REGEL', A.R. kand. fiz.-mat. nauk,red.; SHAGYRIN, K.A., inzh., red.; ACHKINADZE, Sh. D., inzh., red.

[Transistor diotes and triodes; point-contact diodes and triodes] Poluprovodnikovye diody i triody; tochechnye diody i triody. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 52 p. (MIRA 11:11) (Poluprovodniki, no. 7).
(Transistors)

SOMINSKIY, Monus Samuilovich, kand. fiz.-mat. nauk; IOFFE, A.F., akademik, glavnyy red.; MASLAKOVETS, Yu.P., doktor fiz.-mat. nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat. nauk, red.; RYGEL', A.P., kand. fiz.-mat. nauk, red.; SUBASHIYEV, V.K., kand. fiz.-mat. nauk, red.; SHAGURIN, K.A., inzh., red.; ACHKINADZE, Sh.D. inzh., red.; FRENKEL, D.P., tekhn. red.

[Photoresistors] Fotosoprotivleniia. Leningrad, Leningr. dom nauchno-tekhn. propagandy, 1957. 54 p. (Poluprovodniki, no.6). (MIRA 11:9) (Photoelectric cells)

SUBASHIYEV, Vagan Kasparovich, kand. fiz.-mat nauk,; IOFFE, A.F., akad., glavnyy red.; SOMINSKIY, M.S.,kand. fiz.-mat. nauk,red.; MASLAKOVETS, Yu. P.,doktor fiz.-mat. nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYM, S.S., doktor fiz.-mat. nauk, red.; REGEL', A.R., kand. fiz.-mat. nauk, red.;SHAGURIN, K.A.,inzh.,red.; ACHKINADZE, Sh.D.,inzh.,red.; FREGER, D.P., tekhn. red.

[Photoelectric converters of solar energy] Fotoelektricheskie preobrazovateli solnechnoi energii. Leningrad, Leningr. dom nauchno-tekhn. propagandy, 1957. 61 p. (Poluprovodniki, no. 9). (MIRA 11:12)
(Solar batteries)

GELLER, Isaak Khaimovich, inzh.; MESKIN, Samuil Semenovich, inzh.; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk; SMOLENSKIY, G.A., doktor fiz.mat.nauk; SHALYT, S.S., doktor, fiz.-mat.nauk; REGEL', A.R., kand.fiz.-mat. nauk; SUBASHIYEV, V.K., kand.fiz.-mat.nauk; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D, inzh, red; FREGER, D.P., tekhn.red.

[Semiconductor contact rectifiers] Poluprovodnikovye vypriamiteli. Leningrad, Leningr.dom nauchno-tekhn.propagandy, 1957. 94 P. (MIRA 10:12)

(Electric current rectifier)

ZHUZE, Vladimir Panteleymonovich; IOFFE, A.F., akademik, glavnyy red.; SOMINSKIY, M.S., kand.fiz.-mat.-nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand.fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh., red.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Semiconducting materials (semiconductor elements)] Poluprovodnikovye materialy (elementy - poluprovodniki). Leningrad, 1957. 101 p. (Obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii RSFSR, no.17) (MIRA 12:4)

(Semiconductors)

57-8-18/36

AUTHOR Smolenskiy, G.A.

TITLE On the Appearance of Spontaneous Polarization in Cristals. (K voprosu vozniknoveniya spontannoy polyarizatsii v kristallakh.)

PERIODICAL Zhurnal Tekhn. Fiz., 1957, Vol. 27, Nr 8, pp. 1778-1783 (USSR)

ABSTRACT A survey is given on the ideas prevailing at present. The critics on the development of ROCHELLE salt electricity are investigated. The problem of ROCHELLE-salt-active ions and the problem of the nature of the chemical compounds in ROCHELLE-salt electrics and anti-ROCHELLE-salt electrics are discussed. Some data on the construction of electronic shells of ions being present in oxygen octahedrons of ROCHELLE-salt electrics (which contain no hydrogen) are given. The author shows that hydrogen compounds, with the presence of which the development of spontaneous polarity in some compounds containing hydrogen is connected, in all ROCHELLE-salt electrics, containing hydrogen or not, are not pure ion compounds. (With 1 table and 11 Slavic references).

ASSOCIATION Leningrad Institute for Semiconductors of the Academy of Sciences of the USSR. (Institut poluprovodnikov AN SSSR, Leningrad.)

SUBMITTED Feb.1, 1957.

AVAILABLE Library of Congress

Card 1/1

Smolenskiy, G. A.

Tsupov, V. A., Agranovskaya, A. I., 57-11-15/33

PA - 3047

AUTHOR SMOLENSKIY G.A., ISUPOV V.A., AGRANOVSKAYA A.I.,

TITLE Phase Transitions in Seignette-Electric Solid Solutions on the Basis of Strontium Pyro Tantalate.
(Fazovyye perekhody v segnetoelektricheskikh tverdykh rastvorakh na osnove pirotantalata strontsiya -Russian)

PERIODICAL Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 4, pp. 803-805 (U.S.S.R.)
Received 6/1957 Reviewed 7/1957

ABSTRACT The solid solutions of the seignette electrica of this type investigated up to now are enumerated in short. The present paper investigates other solid solutions of seignette-electric niobates and tantalates and gives some data on the solid solutions in the following systems : $Sr_2Ta_2O_7$ + $Sr_2Nb_2O_7$, $Sr_2Ta_2O_7$ + $Ba_2Ta_2O_7$ and $Sr_2Ta_2O_7$ + $Ca_2Ta_2O_7$. Hitherto the sample have not been investigated radiographically, but the distinct shifting of CURIE's temperature is indicative of the creation of solid solutions in alimited concentration interval. The samples were produced according to the usual ceramic method and were annealed for one hour at a temperature of 1480°C. An increase of the CURIE temperature of the solid solutions of $Sr_2(Ta,Nb)_2O_7$ was expected on the occasion of the replacement of Ta-ions by Nb-ions. The present paper confirms this expectation, as may be seen from the attached diagrams of the temperature dependence of the dielectricity constant of the solid solutions in the system $Sr_2Ta_2O_7$+$Sr_2Nb_2O_7$. The CURIE temperature increased by about 32° on the occasion of an increase of

Card 1/2

PA - 3022

AUTHOR: SMOLENSKIY G.A., ISUPOV V.A., AGRANOVSKAYA A.I.,

TITLE: The Solid Solutions of Metaniobate and Metatantalate of Barium in Barium-Titanate which Have Seignette-Electric Properties.
(Tverdyye rastvory metaniobata i metatantalata bariya v titanate bariya, obladayushchiye segnetoelektricheskimi svoystvami -Russian)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 113, Nr 5, pp 1053-1056 (U.S.S.R.)
Received 6/1957 Reviewed 7/1957

ABSTRACT: The authors investigated various compound systems $BaTiO_3$ - $Ba_{0,5}NbO_3$ and $BaTiO_3$ - $Ba_{0,5}TaO_3$ with a content (of up to 10 mol.-percent) of $Ba_{0,5}NbO_3$ and $Ba_{0,5}TaO_3$. The polycrystalline samples with a low degree of open porosity were produced in the usual manner. The introduction of barium-metaniobate into the barium titanate modifies the temperature dependance of ε and tg δ considerably. With a content of 1 mol.-% $Ba_{0,5}NbO_3$ the ε - peak vanishes at Curie point and there remains only a salient point in the curve $\varepsilon = f(T)$. If the $Ba_{0,5}NbO_3$ content increases, this salient point becomes less pronounced, and with more than 5 mol-% $Ba_{0,5}NbO_3$ it vanishes entirely. In solid solutions a maximum of ε is found to exist in the domain of the phase transition from the tetragonal to the orthorhombic structure. If the concentration of bariumβmetaniobate increases, the maxima of the curves $\varepsilon = f(T)$ weaker and more washed out, on which occasion they shift towards lower temperatures. The position of the maxima and of the salient points of the curve $\varepsilon = f(T)$ does not depend on frequency in solid solutions. In solid solutions with a high content of barium metaniobate tg δ chan[illegible]

Card 1/2

SMOLENSKIY, G.A.

24(0) PHASE I BOOK EXPLOITATION SOV/1180

Vsesoyuznaya konferentsiya po fizike dielektrikov, Dnepropetrovsk, 1956.

Fizika dialektrikov; trudy konferentsii... (The Physics of Dielectrics; Transactions of the All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1958. 245 p. 3,000 copies printed.

Resp. Ed.: Skanavi, G.I., Doctor of Physical-Mathematical Sciences; Ed.: Filippova, K.V., Candidate of Physical-Mathematical Sciences; Ed. of Publishing House: Starokadomskaya, Ye.L.; Tech. Ed.: Astaf'yeva, G.A.

Sponsoring Agencies: Akademiya nauk SSSR. Fizicheskiy institut, and Dnepropetrovsk. Universitet.

PURPOSE: This book is intended for scientific research workers, professors, industrial engineers and laymen who are interested in the study and use of dielectrics and dielectric materials.

COVERAGE: This volume publishes reports presented at the All-Union Conference on the Physics of Dielectrics, held in Dnepropetrovsk in August 1956, sponsored by the "Physics of Dielectrics" Laboratory of the Fizicheskiy institut

Card 1/

ABSTRACTS OF REPORTS READ AT THE CONFERENCE AND PUBLISHED IN THE JOURNAL "IZVESTIYA AN SSSR, SERIYA FIZICHESKAYA", Nos 3 and 4, 1958

48-22-3-2/30

Polarization and Dielectric Losses in Some Solid Solutions of the First and Second Type. Theses of the Lecture. The Complete Article is Published in ZhTF, 1957, Nr 27, p. 2528 and DAN USSR, 1957, Nr 113, pp. 803 and 1053

3) The system of the solid solutions $BaTiO_3$——$LaAlO_3$ was investigated.
4) Solid solutions of the first type: $(Sr, Ca)_2Ta_2O_7$, $(Sr, Ba)_2Ta_2O_7$, $Sr_2(Ta, Nb)_2O_7$ were investigated on the basis of strontium-pyrotantalate.
5) The results obtained by the provisional investigation of the solid solutions of the second type are given: $BaTiO_3$—— $BaTa_2O_6$ and $BaTiO_3$——$BaNb_2O_6$.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of the Chemistry of Silicates, AS USSR)

1. Crystals--Polarization 2. Alloys--Dielectric properties

Card 2/2

SMOLENSKIY, G.A.

24(6) 9(3,4) **PHASE I BOOK EXPLOITATION** SOV/1503

Akademiya nauk SSSR. Institut poluprovodnikov

Poluprovodniki v nauke i tekhnike, t. 2. (Semiconductors in Science and Technology, Vol 2) Moscow, Izd-vo AN SSSR, 1958. 658 p. 17,000 copies printed.

Resp. Ed.: A.F. Ioffe; Tech. Ed.: R.S. Pevzner.

PURPOSE: This collection of articles is intended for scientists, engineers and technicians.

COVERAGE: The collection, published by the Semiconductor Institute, Academy of Sciences, USSR, under the supervision of Academician A.F. Ioffe, contains Parts II and III of a two-volume work on semiconductors. Part II completes the material on semiconductor devices, begun in Volume I, and Part III describes various semiconductor materials. Lack of space did not permit inclusion of such subjects as crystal counters, thermoelectric generators, atomic batteries, luminophores, semiconductor catalyzers, materials for complex cathodes and various other applications of semiconductors. Ioffe points out that the article by the American scientists V. Johnson and K. Lark-Horovitz on semiconductors at low temperatures deals with a subject hardly covered in the Soviet literature. Similarly, the article by the Swiss scientists G. Busch and U. Winkler fills a gap in the Soviet literature on methods of investigating semiconductor characteristics. These subjects will be dealt with exclusively in a proposed third volume. References appear separately after each article.

TABLE OF CONTENTS:

The author discuss the application of ferromagnetic semiconductors in multichannel telephony, radar, electroacoustics, electronic counters, cores of induction coils, transformers and filters, permanent magnets, magnetostriction transducers, memory elements, etc. They explain the crystallography of ferrites and the theoretical fundamentals of noncompensated antiferromagnetism.

Card 6/9

They also discuss problems of magnetic saturation in ferrites and their behaviour in a-c magnetic fields and at very high frequencies. Special chapters cover such subjects as electromagnetic oscillations in ferrites and nonlinear processes occurring at very high frequencies. The concluding chapters deal with the electric properties of ferrites and with ferrite materials and their selection. There are 53 references, of which 33 are English and 20 Soviet.

The authors explain the differences and similarities between seignetoelectric, piezoelectric and ferromagnetic materials. They present a historical survey of seignetoelectricity and provide data tables of seignetoelectric materials. The authors explain the fundamentals of the microscopic theories on seignetoelectric phenomena and discuss in detail the crystal lattice structure, physical properties and problems of producing various seignetoelectric materials. They briefly describe antiseignetoelectric materials and draw attention to recently adopted applications of these materials, e.g., miniature capacitors, nonlinear capacitors, piezoelements and memory elements. There are 35 references, of which 20 are Soviet, 13 English

Card 7/9

AUTHORS: Smolenskiy, G. A., Agranovskaya, A. I. SOV/57-28-7-21/35

TITLE: Dielectric Polarization and Losses of Some Complex Compounds (Dielektricheskaya polyarizatsiya i poteri nekotorykh soyedineniy slozhnogo sostava)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol. 28, Nr 7, pp. 1491 - 1493 (USSR)

ABSTRACT: The authors investigate by the example of oxygen compounds with perovskite structures the possibility of obtaining compounds of complex composition. In this case the general formula reads: $(A_1, \ldots, A_k)(B_1, \ldots, B_j)O_3$. The conditions necessary for the ions A_i and B_i are written down. Considering that the ions tend to a certain coordinate number it may be assumed that the possibility of the formation of a number of compounds $(A_1,A_2)(B_1,B_2)O_3$ with perovskite structure is not impossible. In an analogous way also the possibility of the formation of solid solutions of compounds with complex composition and perovskite structure, as well as of compounds and solid solutions of other structures can be investigated. A number of such compounds and solid so-

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lutions were synthetically investigated on this basis. It was shown that of the investigated compositions with perovskite structure $Pb_3(NiNb_2)O_9$ and $Pb_3(MgNb_2)O_9$ have a high dielectric constant. $Pb_3MgNb_2O_9$ is a ferroelectric substance with a Curie temperature of -10°C. The high dielectric constant of $Pb_3NiNb_2O_9$ is dependent on the relaxation mechanism of polarization. It is possible that the relaxation mechanism in $Pb_3NiNb_2O_9$ and in some other compounds and their solid solutions does not depend on ion processes but on electron processes. It is assumed that a ferro-electric phase transition exists in the "relaxators" at sufficiently low temperatures. The difference in the mechanisms of dielectric polarization in the compounds $Pb_3MgNb_2O_9$ and $Pb_3NiNb_2O_9$ in the investigated temperature interval proves the important role played by the structure of the electron shells of the ions and the character of the chemical binding. Thus a ferroelectric substance with complex composition was discovered for the first time. The authors show ways for searching ferro-

Dielectric Polarization and Losses of Some Complex Compounds SOV/57-28-7-21/35

electrics, and moreover of compounds of complex composition as well as of solid solutions with interesting electric and magnetic properties. R.A.Zvinchuk assisted in this work and supervised the determination of the lattice parameters of elementary cells of the investigated compounds.
It could not be found which of the formulae was correct, that with or that without brackets. One of them must be a misprint.
There are 1 figure, 1 table, and 1 Soviet reference.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute for Semiconductors, AS USSR, Leningrad)

SUBMITTED: January 7, 1958

1. Complex ions--Polarographic analysis

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124(c)

AUTHORS: Smolenskiy, G. A., Agranovskaya, A. I., Popov, V. N., Isupov, V. A. SOV/57-28-10-8/40

TITLE: New Ferroelectric Substances of a Complex Composition (Novyye segnetoelektriki sloznnogo sostava)

II. $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6 (II. $Pb_2Fe^{3+}NbO_6$ i Pb_2YbNbO_6)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2152-2153 (USSR) 1958

ABSTRACT: This paper covers an account of the synthetic production of polycrystalline samples of $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6. They were synthetized by a reaction in solid phase according to conventional powder-metallurgical methods. The Pb_2FeNbO_6 samples were sintered at 950°C, the Pb_2YbNbO_6 at 900°C. It was established by X-ray structural analyses that the compounds produced have a perovskite-structure, the niobium-, ytterbium-, and iron ions occupying octahedric positions. The dielectric constant of Pb_2FeNbO_6 samples passes through a maximum at 112°C. Pronounced dielectric hysteresis loops are found at room temperature. Hence

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New Ferroelectric Substances of a Complex Composition, SOV/57-28-10-8/40

II. $Pb_2Fe^{3+}NbO_6$ and Pb_2YbNbO_6

$Pb_2Fe^{3+}NbO_6$ is a ferroelectric substance. The maximum of the dielectric constant of Pb_2YbNbO_6, which is small, is found at a much higher value, at 280°C. The curve $\varepsilon = f(T)$ exhibits a kink near 240°C. tg δ equals 0.3% at room temperature and a frequency of 1 kcy. It quickly increases at heating, passing through a not very deep minimum at about 240°C, and increasing again henceforth. The dielectric constant versus temperature function typical of antiferroelectric substances, the absence of a hysteresis loop and the sufficiently small geometric criterion t ($t \simeq 0.95$) substantiate the assumption that Pb_2YbNbO_6 is an antiferroelectric substance. There are 1 figure and 3 references, 2 of which are Soviet.

SUBMITTED: May 8, 1958

Card 2/2

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

Dielectric polarization of solid solutions in the system (Ba,Sr) $(Ta,Nb)_2O_6$. Je '59. (MIRA 12:10)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Solutions, Solid--Electric properties)

SMOLENSKIY, G.A.; AGRANOVSKAYA, A.I.; POPOV, S.N.

Polarization mechanism in $Pb_3NiNb_2O_9$-$Pb_3MgNb_2O_9$ solid solutions. Fiz.tver.tela 1 no.1:167-168 Ja '59. (MIRA 12:4)
(Solutions, Solid) (Polarization (Electricity))

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

New group of seignettoelectrics with a laminated structure. Fiz. tver.tela 1 no.1:169-170 Ja '59. (MIRA 12:4)
(Ferroelectric substances)

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

New seignettoelectics of complex composition of the type $A^{+2}_2(B^{+3}_I B^{+5}_{II})O_6$
Part 1. Fiz.tver.tela 1 no.1:170-171 Ja '59. (MIRA 12:4)
(Ferroelectric substances)
($A^{+2}_2(B^{+3}_I B^{+5}_{II})O_6$)

SMOLENSKIY, G.A.; ISUPOV, V.A.; AGRANOVSKAYA, A.I.

Seignettoelectric properties of solid solutions in the system $PbNb_2O_6$ - $BaNb_2O_6$ - $SrNb_2O_6$. Fiz. tver. tela 1 no.3:442-449 Mr '59. (MIRA 12:5)

1.Institut poluprovodnikov AN SSSR, Leningrad.
(Solutions, Solid) (Curie point) (Ferroelectric substances)

SMOLENSKIY, G.A.; AGRANOVSKAYA, A.I.; ISUPOV, V.A.

New seignettoelectrics of complex composition. Part 3: Pb_2MgWO_6; $Pb_3Fe_2WO_9$, Pb_2FeTaO_6. Fiz. tver. tela 1 no.6:990-992 Je '59. (MIRA 12:10)

1. Institut poluprovodnikov Akademii nauk SSSR, Leningrad.
(Ferroelectric substances)

66336
SOV/181-1-10-11/21

~~24(6)~~ 24.7800

AUTHORS: Smolenskiy, G. A., Agranovskaya, A. I.

TITLE: Dielectric Polarization of a Number of Compounds of Complex Composition

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 10, pp 1562 - 1572 (USSR)

ABSTRACT: The ε- and tgδ-values were measured at room temperature and 1 kilocycle by the usual methods for a number of polycrystalline, synthetic complex compounds. The results obtained for 19 samples (such as $Ba(Ta, Al)O_3$, $Ba(Nb_{0.5}, Al_{0.5})O_3$, $Pb(Ta, Al)O_3$, $Ba(Ni,Nb)O_3$, etc) are given in table 4. Table 3 contains the exact composition of the various samples, the preliminary and final annealing temperature and annealing time. 8 of these samples belong to the perovskite minerals.

The structure of one sample was indicated by I. G. Ismail-zade. Further results of measurement are shown in diagrams: the temperature dependence of the ε- and tgδ-values of $Pb_3(Mg,Nb_2)O_9$ at 1 kilocycle (Fig 1); the ε- and tgδ-values

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Dielectric Polarization of a Number of Compounds of Complex Composition

of $Pb_3(Ni,Nb_2)O_9$ at 1, 45, 450, and 1500 kilocycles (Figs 2-3); the ϵ- and tgδ-values of some more samples (Fig 4), and the ϵ- and tgδ-values of the sample 1-10 at 1, 450, and 1500 kilocycles. Theoretical considerations which have been discussed in detail in the introductory note and experimental results permit the following conclusions: 1) Certain complex compounds of a particular structure as well as their solid solutions can be predicted on the basis of the condition of electric neutrality, the specific nature of the crystal structure and the tendency of ions to subordinate themselves to a certain coordination. The phase diagram of the corresponding multicomponent system need not be studied. 2) Among the investigated perovskite samples, $Pb_3(Ni,Nb_2)O_9$ and $Pb_3(Mg,Nb_2)O_9$ have the largest dielectric constant. The compound $Pb_3(Mg,Nb_2)O_9$ is a Seignette salt. The dielectric polarization of $Pb_3(Ni,Nb_2)O_9$ is characterized by relaxation and piezoelectric processes. It is assumed here that the activation energy of relaxing particles be very small within the region of phase transition. The results

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Dielectric Polarization of a Number of Compounds of Complex Composition SOV/181-1-10-11/21

of this investigation were published at the II All-Union Conference on Ferroelectricity held at Rostov-na-Donu in 1957. There are 5 figures, 4 tables, and 11 references, 6 of which are Soviet.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute for Semiconductors of the AS USSR, Leningrad)

SUBMITTED: August 4, 1958

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66337
SOV/181-1-10-12/21

~~24(6)~~ 24.7900

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I.

TITLE: Ferroelectric Solid Solutions of Substitution With Subtraction

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 10, pp 1573 - 1582 (USSR)

ABSTRACT: In order to complement publications by many Western authors and the Soviet scientists Skanavi and Ksendzov, the authors studied the ferroelectric properties of the following systems: $BaTiO_3$-$Ba_{0.5}NbO_3$; $BaTiO_3$-$Ba_{0.5}TaO_3$; $BaTiO_3$-$La_{2/3}TiO_3$; $BaTiO_3$-BaO:NiO; $BaTiO_3$-WO_3; $BaTiO_3$-BaO:$AlO_{1.5}$; $BaTiO_3$-$NaTiO_{2.5}$. The samples were prepared by the usual ceramic methods. For burning temperatures of the samples see table 1. The temperature dependence of the ε- and tgδ-values for the individual systems is graphically illustrated in figures 1,2,4, 5, 6 and 10. Figure 3 shows the temperature dependence of phase transformations occurring in the solid solutions of the systems $BaTiO_3$-$La_{2/3}TiO_3$ and $BaTiO_3$-$LaAlO_3$. The temperature dependence

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Ferroelectric Solid Solutions of Substitution With Subtraction

of the specific elongation of the solid solutions of $BaTiO_3$-$Ba_{0.5}$-NbO_3 is depicted in figure 8. Figure 7 represents the dielectric hysteresis loops of the solid solution of the system $BaTiO_3$-$Ba_{0.5}NbO_3$ as dependent on the $BaNbO_3$ content. Figure 9: temperature dependence of the dielectric constant of the solid solutions of the system $BaTiO_3$-$Ba_{0.5}NbO_3$ as dependent on the $Ba_{0.5}NbO_3$ concentration. Final digest: 1) The ferroelectric solid solutions of substitution with subtraction may be divided into two groups: a) In the first group the maximum of the dielectric constant at the Curie point is retained even if the solid solution contains a high percentage of the second component. b) The maximum of the dielectric constant of the second group is suppressed already by a small percentage of the second component. The first group includes the solid solutions of $La_{2/3}TiO_3$ in $BaTiO_3$, whereas the solid solutions of $Ba_{0.5}NbO_3$, $Ba_{0.5}TaO_3$, and BaO:NiO in $BaTiO_3$ belong to the second group. 2) The properties

Ferroelectric Solid Solutions of Substitution With Subtraction

of the solid solutions (second group) of substitution with subtraction may be explained by the perturbing effect of electrons and holes located near the vacancies of the crystal lattice. The first report on this investigation was delivered at the All-Union Conference on Ferroelectricity held at Rostov-na-Donu in 1957. The Soviet scientists Yu. N. Venevtsev, A. F. Ioffe, Devyatkova, and Stil'bans are quoted in this article. There are 10 figures, 1 table, and 9 references, 4 of which are Soviet.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute for Semiconductors of the AS USSR, Leningrad)

SUBMITTED: August 18, 1958

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88695

S/058/60/000/010/004/014
A001/A001

9.4300 (and 1043, 1155)

Translation from: Referativnyy zhurnal, Fizika, 1960, No. 10, p.254, # 27014

AUTHORS: Smolenskiy, G.A., Agranovskaya, A.I., Sholokhova, Ye.D.

TITLE: Ferroelectric Properties of Solid $BaTiO_3$-$LaAlO_3$ Solutions

PERIODICAL: Fiz. sb. L'vovsk. un-t, 1959, No. 2 (7), pp. 101 - 106

TEXT: Ferroelectric properties of solid solutions in the $BaTiO_3$-$LaAlO_3$ system were investigated. In this system solid solutions are formed with the structure of perovskite, possessing ferroelectric properties at the high content of barium titanate. The Curie point and dielectric constant in the peak of solid solutions are sharply decreasing with an increase in the content of lanthanum aluminate. No spontaneous polarization occurs in lanthanum aluminate and in solid solutions containing more than 16 molar % $LaAlO_3$. These experimental data corroborate the viewpoint that central ions in ferroelectrics must have the structure of inert gases after losing s- and d-electrons, i.e., must form from atoms with the

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IOFFE, V.A. [translator]; SMOLENSKIY, G.A., red.; BURTSEV, A.K., red.; KORNILOV, B.I., tekhn.red.; POTAPENKOVA, Ye.S., tekhn.red.

[Dielectric spectroscopy; recent studies on the properties of certain ferromagnetic semiconductors and dielectrics: relaxation processes, electric conductance, losses, and the role of structural defects. Translated articles] Dielektricheskaia spektroskopiia; noveishie issledovaniia svoistv nekotorykh ferromagnitnykh poluprovodnikov i dielektrikov: relaksatsionnye protsessy, elektroprovodnost', poteri i rol' defektov struktury. Sbornik statei. Pod red. G.A.Smolenskogo. Moskva, Izd-vo inostr.lit-ry, 1960. 362 p. (MIRA 14:4)

(Spectrum analysis) (Dielectrics) (Semiconductors)

PHASE I BOOK EXPLOITATION SOV/4379

Vsesoyuznaya konferentsiya po fizike dielektrikov. 2d, 1958

Fizika dielektrikov; trudy vtoroy vsesoyuznoy konferentsii (Physics of Dielectrics, Transactions of the 2d All-Union Conference on the Physics of Dielectrics) Moscow, Izd-vo AN SSSR, 1960. 532 p. Errata slip inserted. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Fizicheskiy institut imeni P.N. Lebedeva.

Ed. of Publishing House: Ye.L. Starokadomskaya, Tech. Ed.: I.N. Dorokhina; Editorial Board: (Resp. Ed.) G.I. Skanavi, Doctor of Physics and Mathematics (Deceased), and K.V. Filippova, Candidate of Physics and Mathematics.

PURPOSE: This collection of reports is intended for scientists investigating the physics of dielectrics.

COVERAGE: The Second All-Union Conference on the Physics of Dielectrics held in Moscow at the Fizicheskiy institut imeni P.N. Lebedeva (Physics Institute imeni P.N. Lebedev) in November 1958 was attended by representatives of the principal scientific centers of the USSR and of several other countries. This collection contains most of the reports presented at the conference and summaries of the discussions which followed. The reports in this collection deal with dielectric properties, losses, and polarization, and with specific inductive capacitance of various crystals, chemical compounds, and ceramics. Photoelectrets, ferroelectric crystals, and various radiation and irradiation effects on dielectrics are investigated. The volume contains a list of other papers presented at the conference dealing with polarization, losses, and breakdowns of dielectrics, which were published in the journal Izvestiya AN SSSR, seriya fizicheskaya, Nos. and 2 1960. No personalities are mentioned. References accompany each report.

SIROVA, N.N., akademik, otv.red.; BELOV, K.P., prof., red.; KONDORSKIY, Ye.I., prof., red.; POLIVANOV, K.M., prof., red.; TELESNIN, R.V., prof., red.; SMOLENSKIY, G.A., prof., red.; SHOL'TS, N.N., kand. fiz.-mat.nauk, red.; SMOLYARENKO, E.M., red.; BASHKIROV, L.A., red.; KHOLYAVSKIY, S., red.izd-va; VOLOKHANOVICH, I., tekhn.red.

[Ferrates; physical and physicochemical properties] Ferrity; fizicheskie i fiziko-khimicheskie svoistva. Doklady. Minsk, Izd-vo Akad.nauk BSSR, 1960. 655 p. (MIRA 13:11)

1. Vsesoyuznoye soveshchaniye po fizike, fiziko-khimicheskim svoystvam ferritov i fizicheskim osnovam ikh primeneniya.
2. AN BSSR (for Sirota).
(Ferrates)

S/181/60/002/011/032/042
B006/B060

24.7800 (1035, 1142, 1162)

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I., and Popov, S. N.

TITLE: Ferroelectrics With Blurred Phase Transitions

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2906-2918

TEXT: This is the reproduction of a lecture delivered at the All-Union Conference on Ferroelectricity which took place in Moscow in January, 1960. A report was made on studies conducted on polycrystalline specimens of ferroelectrics with blurred phase transition and belonging to the two systems $Pb(Mg_{1/3}Nb_{2/3})O_3$ - $Pb(Ni_{1/3}Nb_{2/3})O_3$ and $Ba(Nb, Ta)_2O_6$ - $Sr(Nb,Ta)_2O_6$. These ferroelectrics exhibit a relaxation polarization in the region of phase transition. The technique of the specimen preparation has already been described by A. I. Agranovskaya (Ref. 6); and the method of measurement in Ref. 2. Investigation results are illustrated in diagrams and are discussed in great detail. Fig. 1 shows ε and $\tan\delta$ as functions of temperature for $Pb(Ni_{1/3}Nb_{2/3})O_3$ in weak fields at frequencies between 1 and

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Ferroelectrics With Blurred Phase Transitions S/181/60/002/011/032/042
B006/B060

1500 kc. Both curve groups exhibit a maximum between -150 and -100°C, the precise position and height of which is somewhat frequency-dependent. The maximum loss angle is the larger the higher the frequency. Fig. 2 shows the temperature dependence of ε and $\tan\delta$ on $Pb(Mg_{1/3}Nb_{2/3})O_3$ in weak fields at frequencies between 0.4 and 4500 kc. This compound as well exhibits loss angle maxima, lying between -50 and 0°C and which are the higher, the higher the frequency. The ε-maxima (between 9000 and 12000) are the higher, the lower the frequency. At 0.4, 1, and 45 kc they still lie at negative temperatures, but already at positive ones at 450, 1500, and 4500 kc. The ascending part of the $\varepsilon(t)$ curves is frequency dependent, but not so the dropping part. Figs. 3 and 4 show oscillograms of the hysteresis loops of these two compounds at -90 and -196°C, respectively, taken at varying electric field strengths (E_{max} = 20 kv/cm and 60 kv/cm). Fig. 5 shows the temperature dependence of total polarization on $Pb(Mg_{1/3}Nb_{2/3})O_3$, $Pb(Ni_{1/3}Nb_{2/3})O_3$, and solid solutions $xPb(Mg_{1/3}Nb_{2/3})O_3 + (1-x)Pb(Ni_{1/3}Nb_{2/3})O_3$, the x-values being given near the curves. Fig. 6 shows, for these specimens, the spontaneous polarization as a temperature function, Fig. 7 the

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S/181/60/002/011/042/042
B006/B060

9,2181 (also 1162)

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Agranovskaya, A. I., and Kraynik, N. N.

TITLE: New Ferroelectrics of a Complicated Composition. IV

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2982-2985

TEXT: This is a report on the discovery of new perovskite-type ferroelectrics, which may be described by the empirical formulas $[Bi_{0.5}Na_{0.5}]TiO_3$ and $[Bi_{0.5}K_{0.5}]TiO_3$. The Curie temperatures of these compounds are 320° and 380°C, respectively. The compounds were prepared by mixing the initial substances Bi_2O_3, TiO_2, K_2CO_3, and Na_2CO_3 in a stoichiometric ratio, and by sintering them in the air at 1120-1140 (Bi-Na) and 1060°C (Bi-K) for an half an hour to two hours. The perovskite structure of the compounds thus obtained was established by X-rays. The parameters of the elementary cells of the two compounds were found to be a = 3.88 and 3.94 A, respectively. In the said compounds, the authors determined ε, $\tan\delta$,

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New Ferroelectrics of a Complicated Composition. IV

S/181/60/002/011/042/042
B006/B060

the relative longitudinal expansion $\Delta l/l$ and the coefficient of linear expansion α as temperature functions. Results are shown in Figs. 1 and 2. A study of polarization revealed that sodium bismuth titanate has a well-shaped almost rectangular hysteresis loop, whereas that of potassium bismuth titanate is far from saturation. The first mentioned compound has at 116°C a spontaneous polarization of 8.0 μ coul/cm^2 and a coercive force of 14 kv/cm. It was further established that also $\left[Na_{0.5}Bi_{0.5}\right]ZrO_3$ and $\left[K_{0.5}Bi_{0.5}\right]ZrO_3$ have a perovskite-type crystallization. There are 2 figures and 18 references: 15 Soviet, 1 US, and 2 British.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: June 30, 1960

20151

S/181/61/003/002/049/050
B102/B201

9.4300 (and 1147, 1155, 1158)

AUTHORS: Smolenskiy, G. A., Chang Tsung, and Stankevich, A. K

TITLE: Effect of electron diffusion upon the radio-frequency dispersion of the magnetic permeability of garnet-type ferrites

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961, 663-667

TEXT: In weak electric and magnetic fields, certain ferrites display relaxation processes which are correlated with electron diffusion. The mechanism of these relaxation processes has never been fully clarified so far. In this connection, a study was made of the complex magnetic permeability and the complex dielectric constant, as well as of the dielectric and semiconductor properties (the latter were studied by Ya. M. Ksendzov and V. A. Stogova). Concerning the study of the dispersion of the magnetic permeability a report has already been given at the 3rd All-Union Conference concerned with physics, the physicochemical properties of ferrites, and the physical bases of their application (June, 1959, Minsk). The polycrystalline specimens were prepared by the usual ceramic technique, using analytically pure

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Effect of electron ...

10^6 and 10^7 ohm·cm. When the specimens were heated in oxygen current, the concentration of Fe^{2+} ions was reduced, and resistivity increased. Fig. 2 shows the frequency dependence of μ' and μ" at room temperature and H≈1 moe of polycrystalline specimens prior to (curves 1 and 1') and after (2, 2') heating in oxygen current (15 hr at 1000°C). 1-2% of CuO was added to some of the specimens (curves 3 and 3'), their resistivity ranged between 10^{10} and 10^{11} ohm·cm at room temperature; similar results were obtained on specimens with 1-2% Mn_2O_3 addition (4, 4'). For a comparison, Fig. 2 shows, moreover, the frequency dependence of μ' of single crystals (curve 5). The single crystals had a resistivity of 10^{12} ohm·cm. A study of the three abovementioned solid solutions showed that μ' is reduced with increasing Al^{3+} concentration, and that the maximum of μ" is shifted toward higher frequencies. The introduction of Cr^{3+} increases μ'. The magnetic and electric spectra (i.e., μ'(f) and ε'(f)) of the ferrites investigated have a similar course. In all cases where there arises electron diffusion, μ' and ε' attain high values at small frequencies. A final clarification of the effect of electron diffusion upon the dispersion of magnetic permeability requires further studies. V. A. Ioffe, A. G. Gurevich, and I. Ye. Gubler are men-

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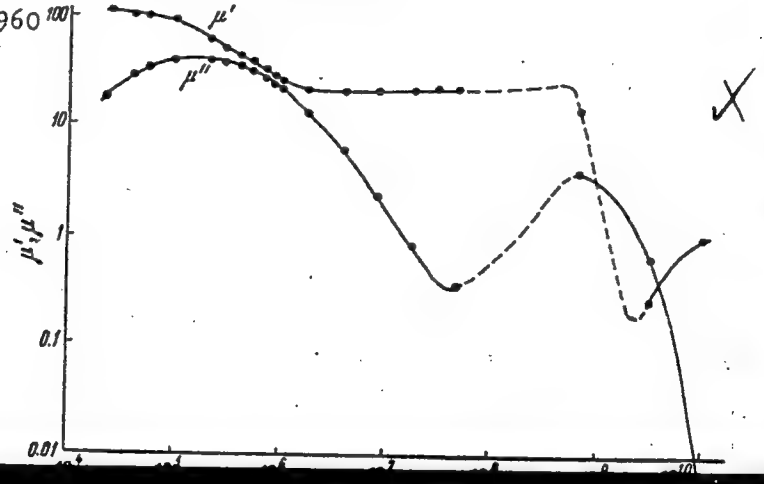
Effect of electron ...

tioned. There are 2 figures and 8 references: 5 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: September 3, 1960

Fig. 1



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20796

S/181/61/003/003/022/030
B102/B205

9,4300 (1136, 1145, 1147, 1153)

AUTHORS: Smolenskiy, G. A., Isupov, V. A., and Agranovskaya, A. I.

TITLE: Laminated ferroelectrics of the oxygen-octahedron type

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 895-901

TEXT: In an earlier paper (Ref. 1: FTT, I, 1, 169, 1959), the authors have uttered the opinion that compounds of the general formula $ABi_2B_2O_9$ ($A = Ca^{2+}$, Sr^{2+}, Ba^{2+}, Pb^{2+}, Bi^{3+}; $B = Ti^{4+}$, Nb^{5+}, Ta^{5+}) have ferroelectric properties. Now they report on the proof of these properties and the manufacture of the new group of ferroelectrics. In the lattice of these compounds, perovskite-type layers $(AB_2O_7)^{2-}$ consisting of BO_6 octahedra alternate with $\left[(Bi_2O_2)^{2+}\right]_x$ layers. Such crystals have face-centered, orthorhombic unit cells which, in first approximation, are considered to be body-centered tetragonal cells. The specimens (8-10 mm diameter, 0.5-2 mm thickness) were made of powdered oxides or salts of the corresponding metals: PbO, $SrCO_3$, $BaCO_3$, Bi_2O_3 trade-marked "ЧДА" (pro analysi), $CaCO_3$, TiO_2

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Laminated ferroelectrics ...

trade-marked "ч" (pure), Nb_2O_5 (containing Nb 99.4%, Ta 0.2%, Fe 0.06%, Si 0.04%), and Ta_2O_5 (TiO_2 < 0.25%, Fe_2O_3 0.18%). The specimens were pressed from the powder mixtures, heated to 700°C (for 4 hr) in air, again powdered and heated to temperatures which are listed in Table 1 (holding time: 1 hr). The losses in weight (in lead and bismuth oxides) are given in %. The X-ray structural analysis was carried out by I. G. Ismailzade. The temperature dependence of the initial values of ε for some of the compounds is shown in Figs. 2 and 3; the course of ε(T) on heating and cooling is shown for $PbBi_2Nb_2O_9$. tan δ of these compounds at 1 kc and room temperature was equal to 0.01. It is seen that some compounds show a monotonic increase of ε without an extremum, while other compounds have broad or sharp maxima. The highest value of ε is reached by $BaBi_4Ti_4O_{15}$. Fig. 4 shows the temperature dependence of ε and tan δ of the solid solutions $(Pb_{1-x}Ba_x)Bi_2Nb_2O_9$ at 1 kc, and of the compound $BaBi_2Nb_2O_9$ at 1 kc (continuous line) and 450 kc (broken line). The figures beside the curves are the values of x. Fig. 5 shows the x-dependence of the temperature at which

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ε reaches its maximum for $(Pb_{1-x}Ba_x)Bi_2Nb_2O_9$ at 1kc (1) and 450 kc (2), and for $(Pb_{1-x}Sr_x)Bi_2Nb_2O_9$ at 500 kc (3). The chemical composition (1) and the temperatures of the phase transition (2) of niobates (a), tantalates (b), and titanates (c) studied are listed in Tables 2 and 3. It may be seen that all compounds of the new group of ferroelectrics have a comparatively high phase-transition temperature. This fact is attributed to the presence of Bi^{3+} ions. Concerning the selection of the ions A and B, it is necessary to follow the instruction given in Ref. 8 (G. A. Smolenskiy and A. I. Agranovskaya, FTT, I, 10, 1562, 1959) for the manufacture of such ferroelectrics. The fact that the radii of the ions A^{2+} and Bi^{3+} vary considerably is held responsible for the disturbance of the arrangement of the cations forming the compound $CaBi_2Nb_2O_9$ in several compounds with a laminated structure. This explains the width of the phase transition (blurredness) and the occurrence of relaxation polarization in $BaBi_2Nb_2O_9$. There are 5 figures, 3 tables, and 8 references: 7 Soviet-bloc and 1 non-Soviet-bloc.

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9,4300 (1136, 1145, 1155)

AUTHORS: Smolenskiy, G. A., Kraynik, N. N., and Agranovskaya, A. I.

TITLE: Antiferroelectric properties of some solid solutions on the basis of $PbMg_{1/2}W_{1/2}O_3$

PERIODICAL: Fizika tverdogo tela, v. 3, no. 3, 1961, 981-990

TEXT: Antiferroelectrics of the perovskite type have so individual properties that no "typical" compound (such as $BaTiO_3$ in the group of ferroelectrics) can be found. When investigating antiferroelectric effects, it is therefore necessary to compare the properties of solid solutions with various antiferroelectrics as basic material. One of the most important problems in the field of antiferroelectrics is the stability of the ferroelectric and the antiferroelectric phases. A study has now been made of this problem with the aid of the new antiferroelectric $PbMg_{1/2}W_{1/2}O_3$, and the effect of a substitution of the ions A or B in this compound has been studied (A denotes the ions contained in perovskite-type lattices ABO_3, in sites with the coordination number 12, and B denotes the

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Antiferroelectric properties ...

basis of $PbZrO_3$ and $NaNbO_3$. 2) Solid solutions with $BaMg_{1/2}W_{1/2}O_3$ and $CaMg_{1/2}W_{1/2}O_3$ showed no ferroelectric phase. A new, obviously antiferroelectric phase appears in solid solutions with $CaMg_{1/2}W_{1/2}O_3$. 3) In the antiferroelectric phase of solid solutions with $PbTiO_3$ and $PbMg_{1/3}Nb_{2/3}O_3$ at a concentration of the second component of 5-7 and 20-25%, respectively, a forced phase transition into the ferroelectric phase, occurs in a strong electric field. The critical field within which this phase transition occurs, increases with a rise in temperature. 4) In solid solutions on the basis of $PbMg_{1/2}W_{1/2}O_3$, the phase transition from the antiferroelectric into the paraelectric phase is accompanied by a reduction in volume. Thus, the occurrence of the antiferroelectric state may give rise to a reduction in volume of the primary unit cell (solid solution on the basis of $PbZrO_3$) or an increase in volume (solid solution on the basis of $PbMg_{1/2}W_{1/2}O_3$) as compared to the paraelectric state. 5) Certain compositions of solutions with $PbTiO_3$ and $PbMg_{1/3}Nb_{2/3}O_3$ show both ferroelectric and relaxative properties. 6) Experimental data on the relative stability of the ferro-

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AUTHORS: [illegible]enskiy, G. A., Chang [illegible] and Shen, Ye S

TITLE: Ferrimagnetic materials with [illegible] structure exhibiting by a high initial permeabil[illegible]

PERIODICAL: Fizika tverdogo tela, v. [illegible], 1608-1611

TEXT: It had been previously [illegible]en that solid solutions of ferrites with spinel structure, [illegible] the tetrahedral sites [illegible] which the magnetoactive ions of the transition metals of the 3d group were replaced by diamagnetic ions (Zn^{2+}, Cd^{2+}), exhibited a particularly high initial magnetic permeability. It had been also established that saturation magnetization in such ferrites passes through a maximum, and that the Neel temperature and saturation magnetostriction of polycrystalline samples are reduced on a rise of Zn or Cd content. The authors of the present paper continued studying the properties of various compounds of the system $\{Y_3\}[Fe_{2-x}Cr_x](Fe_3)O_{12}$ and were able to show that these compounds exhibit an increased initial permeability at low frequencies (for x = 0 [illegible]2150,

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for $x = 0.1$ $\mu \simeq 250$). Yet, this system forms, like systems $\{Y_3\}[Fe_{2-x}Sc_x](Fe_3)O_{12}$ and $\{Y_3\}[Fe_{2-x}In_x](Fe_3)O_{12}$ a limited series of solid solutions, whereas a continuous series of solid solutions can be formed in the systems $\{Y_{3-2x}Ca_{2x}\}[Fe_{2-2x}M_{2x}](Fe_3)O_{12}$, where $M = Ti^{4+}$, Zr^{4+}, Sn^{4+}. In these systems, saturation magnetization for $x = 0.3$ attains a maximum and the Curie temperature drops. The initial permeability was determined on polycrystalline samples from solid solutions of the last mentioned system. The conditions for the production of different solid solutions, the content of the second component in them, as well as the measured μ_0 values are collected in the table. The formation of the solid solutions was checked radiographically in each case. A microstructural analysis was also performed in some cases. The pores were usually not larger than fractions of a micron, and only rarely were 1-1.5 μ. As may be seen, permeability rises at room temperature with the content of diamagnetic ions. This increase of μ cannot be explained by a limitation of the magnetic anisotropy and of magnetostriction due to the approach to the Curie point; the fact must be also taken into account, as

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has been shown by studies of the temperature dependence of μ_o, that the maximum value of μ_o rises with the content of diamagnetic ions. The authors believe that anisotropy and magnetostriction drop in consequence of a diminution of the content of magnetically active ions. The value of μ_o is determined by shifts of the domain boundaries. K. P. Belov and L. A. Fomenko are mentioned. There are 1 figure, 1 table, and 6 references: 5 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: S. Geller. J. Appl. Phys. 31, 5, 305, 1960

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: January 17, 1961

Legend to the Table: 1, content of second component in mole%; 2, last thermal treatment; 3, density in g/cm^3; 4, maximum temperature; 5, holding time in hours; 6, apparent density; 7, density in % of theoretical values; 8, μ_o for t = 20°C and f = 10^4 cps.

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24.7800 (1043, 1145, 1035)
24.2200 1144, 1147, 1158,

AUTHORS: Smolenskiy, G. A., Isupov, V. A., Kraynik, N. N., and Agranovskaya, A. I.

TITLE: Coexistence of the ferroelectric and ferrimagnetic states

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 25, no. 11, 1961, 1333-1339

TEXT: This paper was read at the Conference on ferromagnetism and antiferromagnetism in Leningrad, May 5-11, 1961. The authors studied substances having both ferroelectric and ferromagnetic or antiferromagnetic properties. Among the crystals known so far only the perovskite-type structures include a greater number of ferroelectrics and substances with magnetic ordering. If a perovskite-type crystal ABO_3 contains a definite concentration of ions of transition elements with non-compensated spins, magnetic ordering may arise. Ferromagnetic properties will arise when the A and B ions have high polarizability. In perovskite-type crystals, ferrimagnetism may be achieved by a certain ordering of the ions in the B sublattice in solid solutions. The latter are assumed to have the structure

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Coexistence of the ferroelectric and...

$(1-x)A'B'O_3 - xA''B_{0.5}''B_{0.5}'''O_3$ where the first compound is antiferromagnetic and the second paramagnetic. x denotes the concentration of the second component (mole per cent). The saturation magnetic moment of one ABO_3 unit is calculated under the assumption that the exchange interaction within the B sublattices may be neglected. It was found as

$$m_s = 0.5(m_I - m_{II}) = 0.5\{[m'(1-x) + m''x][1 - E(k_{II})] - m'(1-x)[1 - E(k_I)]\}.$$

m_I and m_{II} are the magnetic moments of sublattices I, II, respectively, m' and m'' the moments of the ions B' and B'', k_I and k_{II} the contributions of nonmagnetic ions to the overall ion number in the sublattices I and II, $E(k) = 6k^5 - 5k^6$ is the probability that a magnetic ion in one of the sublattices has not more than one nearest neighbor among the magnetic ions in the other sublattice. In the considered case, $k_I = 0$ and $k_{II} = x$. In particular the authors studied the solid solution $(1-x)Pb(Fe_{2/3}W_{1/3})O_3 - xPb(Mg_{1/2}W_{1/2})O_3$ which was obtained by sintering the oxides at 900-920°C. X-ray phase analyses were carried out by

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